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RZ1-R03017.01-FD-009

March 30, 1995

ATKEARNEY

Ms. Donna Saunders
Regional Project Officer
U.S. Environmental Protection Agency
Region III - 3HW-61
841 Chestnut Street
Philadelphia, PA 19107

Reference: EPA Contract No. 68-W4-0013; EPA Work Assignment No. R03017; PPG Industries Natrium Plant; New Martinsville, West Virginia: Technical Review of RFI Work Plan and Associated Documents; Final Deliverable

Dear Ms. Saunders:

Enclosed is our Final Deliverable for the review of the PPG Natrium (PPG) facility RFI Work Plan. A draft version of our Report was submitted to the EPA Work Assignment Manager, Ms. Mary Beck, on November 15, 1994. Ms. Beck has indicated by phone that she considers the Report to be satisfactory as presented; therefore, this Final version has not been modified, and is being sent and this time to complete your official contract file.

This review is being submitted in accordance with the Statement of Work received on August 12, 1994 and approved on October 13, 1994. The review of the PPG RFI Work Plan is divided into two sections. The first section consists of general comments regarding the entire document. The second section consists of specific comments that follow the format of the document. The remainder of this letter provides a summary of the major issues and deficiencies identified in the PPG RFI Work Plan.

The Risk Assessment has been reviewed against generally acceptable Risk Assessment protocols; and has been found to be deficient in several areas, as indicated in several general and specific comments. These comments address deficiencies identified by A.T. Kearney, and focus mostly on the progression, or lack thereof, of SWMUs or AOCs from Phase II to Phase III investigation through the use of RCRA action levels for soils (Proposed Subpart S). Due to the proposed use of these action levels, the U.S. EPA may wish to review the PPG Risk Assessment against Region III specific requirements and protocols with respect to any previous negotiations or agreements between the U.S. EPA and PPG.

A major concern at the PPG site is the extreme variability and uncertainty associated with the area groundwater quality and flow regime. The groundwater underneath the site contains documented contamination with a variety of constituents in several plumes.

This contamination is pervasive throughout the site, but exhibits significant variability through time due to the hydraulic forces created by PPG's former and current production well operations. These plumes have reportedly intermingled over time, and differentiation between plume boundaries may be difficult to delineate. Additionally, soils underlying the site are generally loose and permeable, and it is likely that much of the potential contamination associated with the SWMUs and AOCs being investigated will be extremely mobile through the soil, ultimately finding its way to the groundwater.

The Work Plan proposes the assessment of groundwater on a site-wide basis, but does not provide for an assessment of any off-site or Ohio River locations, due to their assumption that the groundwater movement is restricted through "hydraulic containment". This "hydraulic containment" theory is reportedly caused by the pumping of numerous production wells on-site. However, the information provided in the RFI Work Plan and associated DOCC's does not adequately support the theory of hydraulic containment at this stage. The investigation proposes several tasks to support this claim, some of which are not scheduled to be performed until late in the RFI process. Therefore, without this definitive proof of hydraulic containment, much of the investigation is based upon an unproven theory. A.T. Kearney feels that identifying the hydrogeologic characteristics at this site (i.e., proving or disproving hydraulic containment) would provide a significant driver for activities in the RFI. This would require PPG to conduct, at a minimum, Task 13 at the initiation of the Phase II activities instead of at the end of Phase III.

In an October 6, 1994 telephone call with Ms. Beck, A.T. Kearney (ATK) requested a copy of the HSWA permit for the PPG facility to aid in defining permit specific conditions and requirements related to the RFI at the PPG facility. Ms. Beck's instructions were to review the document against "model permit" RFI requirements and technical documentation related to RFIs and environmental investigations (e.g., the RFI Guidance Documents, TEGD, etc.). Therefore it is assumed that the scope (i.e., SWMUs and AOCs being investigated) of the RFI has been deemed acceptable to the U.S. EPA, and ATK's review is based upon the technical adequacy of the proposed investigation.

As indicated in a January 25, 1994, U.S. EPA Region III letter from E.J. Clugston to Ms. Mary Beck, the facility Quality Assurance Project Plan (QAPjP) has already been reviewed and recommended for approval. Therefore the QAPjP document was not separately reviewed by ATK under this assignment. However, as necessary to ensure consistency, we have reviewed the QAPjP against related elements of the RFI Work Plan.

Please feel free to call John Koehnen, the ATK Work Assignment Manager at (312) 223-6253, or me if you have any questions.

Sincerely,

Don R. Beasley
Regional Manager

cc: M. Beck, EWAM - EPA Region III
B. Jordan/Central Files
J. Koehnen, ATK - WAM

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PPG INDUSTRIES, NATRIUM PLANT
NEW MARTINSVILLE, WEST VIRGINIA
RCRA FACILITY INVESTIGATION WORK PLAN REVIEW
EPA ID No. WVD004336343

FINAL REVIEW OF RFI WORK PLAN

Submitted to:

Ms. Donna Saunders
Regional Project Officer
U.S. Environmental Protection Agency
841 Chestnut Street
Philadelphia, PA 19107

Submitted by:

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Bala Cynwyd, PA 19004

EPA Work Assignment No.:	R03017
Contract No.:	68-W4-0013
A.T. Kearney WAM:	John Koehnen
Telephone No.:	(312)223-6253
EPA WAM	Ms. Mary Beck
Telephone No.:	(215)597-7239

March 30, 1995

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FINAL RFI WORK PLAN REVIEW
GENERAL COMMENTS

1. The RFI Work Plan proposes a "Phased Approach" in which activities during later phases are dependant upon results obtained from earlier investigative phases. However, the Work Plan does not provide a mechanism for presenting the results of these phases and proposals for future phases to the U.S. EPA for review and approval. The proposed time line on Figure 6-2 identifies a block of time between phases for EPA review, but does not provide sufficient detail on the information to be submitted and reviewed. Revise the Work Plan to provide additional details on the scope and content of the submittals (i.e., Phase I or Phase II Interim Reports, Phase III Work Plan, etc.) which will be made available to EPA for review and approval. Describe the format of these submittals and how these will impact future phases of the investigation.

2. The Preliminary Risk Assessment proposed does not provide adequate detail regarding the criteria to be used in evaluating whether a specific unit or group of units will undergo additional Phase III activities. Revise the Work Plan to provide details on the criteria to be used, including the applicability and suitability of the RCRA action levels proposed, the three groupings of SWMUs and AOCs as discussed on the bottom of page 4-21, and how and when these assessments will be performed.

   In addition, the Risk Assessment will use results from an investigation which does not propose sampling SWMUs or AOCs on a biased basis. Therefore, the risks determined may not be truly indicative of actual risks associated with potential contamination at the unit. Several specific comments are included which require the investigation to be performed in a biased manner (i.e., collecting samples from areas of known or suspected contamination, rather than at random sampling locations) which will allow the Risk Assessment to use more appropriate data in defining risks. Revise the Work Plan to propose the use of biased sampling results in the Risk Assessment.

3. The RFI Work Plan tends to propose confirmatory sampling investigations at each SWMU and AOC, including those units which have documented and confirmed releases to the soils or groundwater. This type of investigation is not appropriate for

all SWMUs or AOC at the facility, especially those with known or suspected releases. Several units (e.g., SWMU 4-1, 4-2, etc.) with documented releases should undergo a nature and extent investigation to define the rate and direction of contaminant migration. Revise the RFI Work Plan to provide a sampling program more specific to each unit's history (i.e., whether contamination is documented or suspected).

4. The sampling rational for Phase II is to confirm the presence or absence of contamination due to releases from SWMUs or AOCs at the facility. The Work Plan does not provide for the collection of biased samples from most of the units. Sampling strategies in Section 5.3.1.3 of the Work Plan propose the collection of samples from pre-determined areas at a SWMU or AOC with no concession for restrictions imposed by the physical features of a unit (i.e., depth of fill, cracks in pavement, caps or liners installed, etc.) or for screening split spoon samples with an organic vapor analyzer (OVA) at regular intervals to allow for the collection of biased samples based upon the OVA readings. Revise the RFI Work Plan to allow for biased sampling at SWMUs or AOCs during confirmatory sampling activities and include discussion on sampling strategy with respect to the physical features of a specific unit.

5. The use of the Target Compound List (TCL) parameter list (TCL VOCs/SVOCs/PESTs/PCBs) is not adequately justified in the RFI Work Plan. Revise the Work Plan to demonstrate that the TCL is adequate and that constituents in 40 CFR 261, Appendix VIII and 40 CFR 264, Appendix IX but not on the TCL are not present on site. In addition, ensure that the analyte list used is appropriate to collect all potential constituents of concern at the site (e.g., TCL analytes would comprise only a select few chlorinated benzene products or wastes that may be present, while the Marshall Plant may have managed/generated numerous variants). Ensure that all applicable constituents are addressed in the analyte list.

6. The Work Plan does not provide a discussion on the potential presence and significance of Dense Non-Aqueous Phase Liquids (DNAPLs) at the site. DNAPLS or "sinkers" (i.e., TCE, TCA, etc.) may not always act in concert with the groundwater. This means that the groundwater may be controlled by hydraulic containment, but potential DNAPLs may not. Revise the Work Plan to investigate this issue in conjunction with the groundwater quality and hydraulic containment investigations at the site.

7. Tasks associated with certain elements of the RFI should be reordered to allow for the collection of useful data earlier in the investigation. Specifically, Task 13, which is related to the characterization of the groundwater flow regime, is extremely important to the entire investigation but won't be performed until the end of the investigation. This information should be determined early in the investigation to confirm the theory of "hydraulic containment" at the site. Revise the Work Plan to provide for a data collection strategy which will provide the required data in a timely, useful, and

effective manner.

8. Assessing groundwater quality on a site-wide basis may be appropriate for this site during preliminary investigative stages, due to the presence of several commingled contaminant plumes under the site. However, several elements should be considered: The existence of groundwater contamination is not in doubt, however, the source of contamination and the extent of the contamination is; and an attempt to define the groundwater flow on a site-wide basis will likely be futile unless assurances can be made that the current production well locations and pumping scheme will remain constant. If the characterization of the site hydrogeologic characteristics are not specifically defined, then any data gathered and used in the delineation of groundwater flow direction, plume travel assessment, and as a tool in locating future monitoring wells may be inaccurate. Revise the Work Plan to provide for the definition of the hydrogeologic characteristics early in the investigation.

9. The cover letter accompanying the PPG Industries RFI Work Plan contains the following inaccuracies:

- The letter states that the RFI Work Plan proposes an investigation which will be the most cost effective. While cost effectiveness is important, the scope of this and any future investigation shall be based upon effective, technically sound, investigative principals first, and cost effectiveness second;

- The statement that the characteristics of the groundwater at the site are in part controlled by the use of production wells at the site which create a "groundwater capture zone" requires further explanation and investigation. The investigation proposed in the RFI Work Plan shall identify all potential aquifers at the site, including upper and lower water bearing zones and any potential perched aquifers, indicating their relation (i.e., interconnection of aquifers) to the aquifer from which the production wells derive their water;

- The use of risk-based results are not intended to be the sole driver for further investigation at the site especially during the early phases of the investigation. Any areas which exhibit signs of potential contamination at any level above naturally occurring levels may require further investigation; and

- It is likely that ALL analytical data resulting from the RFI will be used to draw conclusions or make decisions, otherwise collection may not be warranted. Therefore, data validation should be performed for all data, or adequate justification will need to be presented in the RFI Report why validation was not performed. Provide for full validation of the resulting data.

While these issues are specific to the cover letter they set the tone for the

investigation proposed in the RFI Work Plan. Revise the Work Plan to ensure that these issues are addressed, as necessary, during the RFI.

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RFI WORK PLAN REVIEW
SPECIFIC COMMENTS

The approval page does not include a space for the signature of the U.S. EPA Project Manager. The approval of the U.S. EPA Project Manager is required. Revise the approval page to include space for the required signature.

1.0 INTRODUCTION (Pages 1-1 to 1-4)

1.2 DESCRIPTION OF CURRENT CONDITIONS REPORT (Page 1-4)

10. Table 1.1 provides a summary of the SWMUs and AOCs that have been identified in the RCRA Facility Assessment (RFA) Report or the Description of Current Conditions (DOCC) Report. This table is incomplete and should contain the following additional information: Provide for differentiation within the table between SWMUs and AOCs. If the AOCs are to be identified as 3-1A, then indicate in a footer that the "A" denotes an AOC, or alternatively identify AOCs as "AOC A" or "AOC 3A", etc. In addition, provide an indication in the table on the reason(s) for excluding specific SWMUs or AOCs from the RFI, or alternatively, provide direct reference to Section 3.10 of the RFI Work Plan to identify the rationale for exclusion.

3.0 SITE ENVIRONMENTAL CONDITIONS

3.2 SITE HISTORY (Pages 3-1 to 3-4, Figures 3-1 to 3-2)

11. The history of the PPG facility and Figure 3-2, include information on former uses of the facility and tenants or lessees who manufacture(d) a variety of chemicals or products on leased areas of the site. These operations (i.e., chemical production, solvent production, etc.) had/have the potential to impact the environment. Provide additional discussion, where possible, on the operational and waste management practices and history of releases on land being leased within the contiguous PPG property. Include information on the Figures which identifies any other operations, both former and current, which have taken place on the PPG property under lease to

another operator.

In addition, revise the RFI Work Plan to state whether the leased areas were evaluated in the DOCC or other investigations. If these areas have not been evaluated, provide the rationale for not identifying SWMUs/AOCs on the leased areas.

3.3 TOPOGRAPHY AND SURFACE WATER (Page 3-5)

12. The second paragraph on page 3-5 states that the Ohio River is the major surface water body within two miles and the third paragraph states that the manufacturing area is outside the 100-year floodplain. These statements should be discussed further to indicate the facility areas which are located within the floodplain (i.e., inclusive of storm or process drains, current or former landfills or impoundments, drum or material storage areas, etc.). A map of the facility should be included which clearly delineates the extent of the 100 year floodplain at the PPG property. Revise the Work Plan to include these additional details.

13. Clarify the statement in the last paragraph on page 3-5 which states that two streams cross the facility and discharge to permitted NPDES outfalls 002 and 021. Revise the Work Plan to discuss the origin and nature (i.e., perennial, intermittent, spring fed, etc.) of these streams and whether they are affected by any operations at the facility prior to their discharge into the Ohio River. Indicate whether these streams receive runoff from process areas or direct point source discharge, or if they merely traverse the site prior to entering the Ohio River. In addition, label these streams on a map of the facility for clarification purposes

3.5 SITE HYDROGEOLOGY (Pages 3-11 to 3-24)

14. Information presented in this section attempts to draw conclusions regarding the characteristics of the groundwater without providing adequate data to justify these conclusions. Additional information is needed to define the characteristics of the aquifer and the effects of production well use. Additionally, the description of the soil characteristics and the soil's ability to transmit water to the perched water or to the groundwater, contain significant data gaps. Since several areas of the soils are defined as silty or sandy clay and have slow/poor infiltration rates, this may tend to create more areas of perched water than are shown on Figures 3-4, 3-5, and 3-6. Revise the Work Plan to provide for the determination of additional areas of perched water, coincidental with the installation of the proposed wells. In addition, provide for a more detailed characterization of the shallow (confined/perched) groundwater zone.

15. The installation logs for on-site wells (either production wells, monitoring wells, or brine wells) are not provided in the RFI Work Plan. Revise the Work Plan to include tables which summarize the construction of the wells including total depths, depth to water, screen lengths, material of construction, aquifer designation of screened interval, etc. Alternatively, provide the installation and geologic logs for all wells and discuss how Tasks 3 and 8 will assess the condition of the on-site wells and their suitability in providing data for this investigation. Include information on the criteria to be used in performing these evaluations.

3.5.1 Production Wells (Page 3-12, Table 3-1)

16. The text of this section and Table 3-1 identify several former production wells which have been abandoned. Ensure that these wells have been abandoned according to the procedures outlined in Section 5.3.2 to ensure that cross contamination will not occur. If they have not been appropriately abandoned, then indicate the abandonment method and potential for contaminant transport. Discuss whether the assessment in Task 9 includes a review of the wells that have previously been abandoned.

3.5.2 Monitoring Wells (Page 3-12, Table 3-2)

17. The facility currently utilizes numerous monitoring wells in the groundwater monitoring program. Many of these wells have screen lengths of up to 40 feet. This is in contradiction with the RCRA Ground-Water Monitoring: Draft Technical Guidance (November 1992) document, which suggests that generally, screen lengths should not exceed ten feet. Discuss the suitability of wells with well screens in excess of 10 feet and discuss the locations of the well screens with respect to the aquifer depth and thickness at those well locations. Provide an assessment of whether the wells with screen lengths in excess of ten feet are likely to provide accurate data during this investigation. In addition, provide details on screen lengths that will be used during subsequent well installations.

18. Table 3-2 identified several wells which have been removed or damaged. However, the RFI Work Plan does not indicate the extent of the damage or whether the damage could cause contaminant transport between aquifers. Revise the Work Plan to indicate the type of damage done to the wells, and whether this damage has the potential to allow the well to act as a conduit for contaminant transport between perched water tables and the alluvial aquifers. For example, well MW-13 which is damaged, is constructed through a perched water table, and concludes at or near the bedrock (based upon information provided in Figure 3-5). Well MW-13 may provide a conduit for potential contaminant transport from the perched water table to the lower saturated zones. Revise the Work Plan to fully evaluate all damaged wells with respect to their potential for cross-contaminating aquifers. Indicate whether the

abandoned and removed wells were abandoned according to the procedures in Section 5.3.2 to ensure that cross contamination did/does not occur.

19. The screened intervals listed in Table 3-2 indicate that several of the wells are screened at or above the approximate river stage of 620 ft msl indicated on page 3-5. Page 3-11 also states that the use of the production wells has dropped the (groundwater) water table to below the level of the river. This information is conflicting and can generally be interpreted in two ways. First, the screened intervals in many of the monitoring wells may not be adequate to monitor the groundwater, or secondly, that the effects of the production wells is not as pronounced as originally indicated. Provide additional information on this issue and modify the table to include information on the average water level in each of the wells for comparison purposes against the screened intervals.

3.5.4 Brine Wells (Pages 3-12 and 3-19)

20. The procedures identified in the second bullet on page 3-19 are reportedly used during the maintenance of the brine wells. This procedure indicates that the water removed through depressurization may contain trace amounts of drip gas, sulfides, and development oils. It also states that the water is directly discharged to the plant stormwater sewers, but later indicates a containment system was recently installed to eliminate the possibility of these materials entering the sewers. Revise the Work Plan to clarify the current procedures used during the brine well maintenance and if these materials are contained, indicate their ultimate disposition. Additionally, provide any analytical information on the wastes that were formerly disposed of directly to the stormwater sewers and indicate the final deposition area(s) for these wastes.

3.6 SURFACE WATER QUALITY (Page 3-24 and 3-27)

21. The RFI investigation does not propose sampling or assessment of surface water or sediment quality. Due to the limited nature of the prior sampling and the potential uncertainty in the influences of groundwater with the Ohio River, surface water and sediments should be assessed in this investigation. Revise the Work Plan to provide an assessment of surface water and sediments. In addition, provide analytical results for the NPDES outfalls, indicating whether constituents of concern have ever been detected in outfall water.

3.7 EXISTING DATA BY RFI AREA (Pages 3-27 to 3-61)

22. The geologic and hydrogeologic information in several areas indicate the presence of geologic materials (i.e., clay, silty/sandy clay, etc.) which may be conducive to the

presence of perched water. This is demonstrated on several figures relating to selected areas and absent in other areas. Areas (i.e., Area 6, Area 7, etc.) where the geology may be conducive to this condition should be reviewed to determine whether sufficient data exists to confirm or deny the existence of perched water. Revise the Work Plan to accommodate this review.

3.7.4 Area 4 - Marshall Plant Waste Pond Area (Pages 3-33 to 3-41)

3.7.4.1 SWMU 4-1: Bottom Fly Ash Landfill Units J-1 and J-2 (Pages 3-33 to 3-40)

23. This section and Figure 3-15 require additional discussion. Page 3-36 indicates that a perched water zone in this area is separated from the landfill materials by a clay layer. This is inconsistent with cross-section A-A on Figure 3-15. The figure shows the water table under the unit in addition to two areas of potentially perched water near TPZ-01 and TPZ-04 where static water levels are indicated. This requires additional discussion regarding the characteristics of this unit. Additionally, cross-section C-C' includes a cross-hatched area adjacent to the Ohio River which is not described in the legend. Since the boring did not reach the water table, discuss how the water level in this area was determined or inferred. Revise this section and figure, as appropriate, to address these issues.

3.7.6 Area 6 - Monochlorobenzene (MCB) Production Area (Pages 3-42 to 3-45)

3.7.6.1 AOC 6-3A: Soils Throughout the MCB Area (Pages 3-43 to 3-45)

24. The first paragraph indicates the presence of a 10-15 foot layer of clay and sandy clay underlying this unit and the second paragraph indicates the presence of till underlain by silty to sandy gravel to 11.5 ft-bgs and fine to coarse sand to 16.5 ft-bgs. The location of the clay and sandy clay layer is not sufficiently defined. Revise the Work Plan to indicate the location of the clay and sandy clay layer with respect to the unit and other layers mentioned. Additionally, discuss the potential for perched water in this area due to the presence of a defined clay and sandy clay layer.

25. The third line in the first paragraph of this section states that the boring logs from MW-7 and MW-8 indicate that the area is underlain by 10 to 15 feet of clay and sand clay. This statement may not be accurate. It is not acceptable to generalize the location of this clay and sandy clay layer based upon two boring logs from wells in the extreme northern corner of the area. Revise this statement to provide additional information supporting this assumption or indicate this condition exists only in the northern corner of this area.

26. In a 1982 preconstruction characterization study of the MCB area, several borings and sample analyses were performed. These analyses reportedly showed elevated levels of organics in the soils at areas within or near the SWMUs in Area 6. However, the DOCC does not discuss these sampling events or results. Provide information on these sampling events and results, and revise the proposed sampling strategy to utilize the results of this study to aid in determining sampling locations at this unit. Revise the Work Plan to include a discussion of these results and to revise the sampling strategy accordingly.

3.8 EXISTING DATA SUMMARY (Page 3-61)

27. The existing data summary leaves many questions unanswered. Throughout Section 3.0, the contention is that production well use has effectively reversed the groundwater flow from the Ohio River to the east toward the plant and more specifically towards discrete production well locations. This conclusion is supported by only two groundwater elevation contour maps from 1988 and 1989. This does not account for the potential contaminant migration in periods prior to or after this mapping. Provide additional historical data, if available, which supports the contention that the production well scheme has effectively contained any contaminant plumes that may be present on the site, or provide for the generation of additional groundwater contour maps necessary to evaluate the facility.

28. Provide information on the practices and operations of lessee's on the PPG properties. Indicate whether any of the current investigations have provided information for those sites and/or on formerly leased sites and whether any of the current or former lessee's have or are performing environmental investigations on the leased PPG property.

3.11 ONGOING ACTIONS (Pages 3-66 and 3-67)

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PPG INDUSTRIES, NATRIUM PLANT
NEW MARTINSVILLE, WEST VIRGINIA
EPA ID No. WVD004336343

RFI WORK PLAN REVIEW
SPECIFIC COMMENTS

The approval page does not include a space for the signature of the U.S. EPA Project Manager. The approval of the U.S. EPA Project Manager is required. Revise the approval page to include space for the required signature.

1.0 INTRODUCTION (Pages 1-1 to 1-4)

1.2 DESCRIPTION OF CURRENT CONDITIONS REPORT (Page 1-4)

10. Table 1.1 provides a summary of the SWMUs and AOCs that have been identified in the RCRA Facility Assessment (RFA) Report or the Description of Current Conditions (DOCC) Report. This table is incomplete and should contain the following additional information: Provide for differentiation within the table between SWMUs and AOCs. If the AOCs are to be identified as 3-1A, then indicate in a footer that the "A" denotes an AOC, or alternatively identify AOCs as "AOC A" or "AOC 3A", etc. In addition, provide an indication in the table on the reason(s) for excluding specific SWMUs or AOCs from the RFI, or alternatively, provide direct reference to Section 3.10 of the RFI Work Plan to identify the rationale for exclusion.

3.0 SITE ENVIRONMENTAL CONDITIONS

3.2 SITE HISTORY (Pages 3-1 to 3-4, Figures 3-1 to 3-2)

11. The history of the PPG facility and Figure 3-2, include information on former uses of the facility and tenants or lessees who manufacture(d) a variety of chemicals or products on leased areas of the site. These operations (i.e., chemical production, solvent production, etc.) had/have the potential to impact the environment. Provide additional discussion, where possible, on the operational and waste management practices and history of releases on land being leased within the contiguous PPG property. Include information on the Figures which identifies any other operations, both former and current, which have taken place on the PPG property under lease to

another operator.

In addition, revise the RFI Work Plan to state whether the leased areas were evaluated in the DOCC or other investigations. If these areas have not been evaluated, provide the rationale for not identifying SWMUs/AOCs on the leased areas.

3.3 TOPOGRAPHY AND SURFACE WATER (Page 3-5)

12. The second paragraph on page 3-5 states that the Ohio River is the major surface water body within two miles and the third paragraph states that the manufacturing area is outside the 100-year floodplain. These statements should be discussed further to indicate the facility areas which are located within the floodplain (i.e., inclusive of storm or process drains, current or former landfills or impoundments, drum or material storage areas, etc.). A map of the facility should be included which clearly delineates the extent of the 100 year floodplain at the PPG property. Revise the Work Plan to include these additional details.

13. Clarify the statement in the last paragraph on page 3-5 which states that two streams cross the facility and discharge to permitted NPDES outfalls 002 and 021. Revise the Work Plan to discuss the origin and nature (i.e., perennial, intermittent, spring fed, etc.) of these streams and whether they are affected by any operations at the facility prior to their discharge into the Ohio River. Indicate whether these streams receive runoff from process areas or direct point source discharge, or if they merely traverse the site prior to entering the Ohio River. In addition, label these streams on a map of the facility for clarification purposes

3.5 SITE HYDROGEOLOGY (Pages 3-11 to 3-24)

14. Information presented in this section attempts to draw conclusions regarding the characteristics of the groundwater without providing adequate data to justify these conclusions. Additional information is needed to define the characteristics of the aquifer and the effects of production well use. Additionally, the description of the soil characteristics and the soil's ability to transmit water to the perched water or to the groundwater, contain significant data gaps. Since several areas of the soils are defined as silty or sandy clay and have slow/poor infiltration rates, this may tend to create more areas of perched water than are shown on Figures 3-4, 3-5, and 3-6. Revise the Work Plan to provide for the determination of additional areas of perched water, coincidental with the installation of the proposed wells. In addition, provide for a more detailed characterization of the shallow (confined/perched) groundwater zone.

15. The installation logs for on-site wells (either production wells, monitoring wells, or brine wells) are not provided in the RFI Work Plan. Revise the Work Plan to include tables which summarize the construction of the wells including total depths, depth to water, screen lengths, material of construction, aquifer designation of screened interval, etc. Alternatively, provide the installation and geologic logs for all wells and discuss how Tasks 3 and 8 will assess the condition of the on-site wells and their suitability in providing data for this investigation. Include information on the criteria to be used in performing these evaluations.

3.5.1 Production Wells (Page 3-12, Table 3-1)

16. The text of this section and Table 3-1 identify several former production wells which have been abandoned. Ensure that these wells have been abandoned according to the procedures outlined in Section 5.3.2 to ensure that cross contamination will not occur. If they have not been appropriately abandoned, then indicate the abandonment method and potential for contaminant transport. Discuss whether the assessment in Task 9 includes a review of the wells that have previously been abandoned.

3.5.2 Monitoring Wells (Page 3-12, Table 3-2)

17. The facility currently utilizes numerous monitoring wells in the groundwater monitoring program. Many of these wells have screen lengths of up to 40 feet. This is in contradiction with the RCRA Ground-Water Monitoring: Draft Technical Guidance (November 1992) document, which suggests that generally, screen lengths should not exceed ten feet. Discuss the suitability of wells with well screens in excess of 10 feet and discuss the locations of the well screens with respect to the aquifer depth and thickness at those well locations. Provide an assessment of whether the wells with screen lengths in excess of ten feet are likely to provide accurate data during this investigation. In addition, provide details on screen lengths that will be used during subsequent well installations.

18. Table 3-2 identified several wells which have been removed or damaged. However, the RFI Work Plan does not indicate the extent of the damage or whether the damage could cause contaminant transport between aquifers. Revise the Work Plan to indicate the type of damage done to the wells, and whether this damage has the potential to allow the well to act as a conduit for contaminant transport between perched water tables and the alluvial aquifers. For example, well MW-13 which is damaged, is constructed through a perched water table, and concludes at or near the bedrock (based upon information provided in Figure 3-5). Well MW-13 may provide a conduit for potential contaminant transport from the perched water table to the lower saturated zones. Revise the Work Plan to fully evaluate all damaged wells with respect to their potential for cross-contaminating aquifers. Indicate whether the

abandoned and removed wells were abandoned according to the procedures in Section 5.3.2 to ensure that cross contamination did/does not occur.

19. The screened intervals listed in Table 3-2 indicate that several of the wells are screened at or above the approximate river stage of 620 ft msl indicated on page 3-5. Page 3-11 also states that the use of the production wells has dropped the (groundwater) water table to below the level of the river. This information is conflicting and can generally be interpreted in two ways. First, the screened intervals in many of the monitoring wells may not be adequate to monitor the groundwater, or secondly, that the effects of the production wells is not as pronounced as originally indicated. Provide additional information on this issue and modify the table to include information on the average water level in each of the wells for comparison purposes against the screened intervals.

3.5.4 Brine Wells (Pages 3-12 and 3-19)

20. The procedures identified in the second bullet on page 3-19 are reportedly used during the maintenance of the brine wells. This procedure indicates that the water removed through depressurization may contain trace amounts of drip gas, sulfides, and development oils. It also states that the water is directly discharged to the plant stormwater sewers, but later indicates a containment system was recently installed to eliminate the possibility of these materials entering the sewers. Revise the Work Plan to clarify the current procedures used during the brine well maintenance and if these materials are contained, indicate their ultimate disposition. Additionally, provide any analytical information on the wastes that were formerly disposed of directly to the stormwater sewers and indicate the final deposition area(s) for these wastes.

3.6 SURFACE WATER QUALITY (Page 3-24 and 3-27)

21. The RFI investigation does not propose sampling or assessment of surface water or sediment quality. Due to the limited nature of the prior sampling and the potential uncertainty in the influences of groundwater with the Ohio River, surface water and sediments should be assessed in this investigation. Revise the Work Plan to provide an assessment of surface water and sediments. In addition, provide analytical results for the NPDES outfalls, indicating whether constituents of concern have ever been detected in outfall water.

3.7 EXISTING DATA BY RFI AREA (Pages 3-27 to 3-61)

22. The geologic and hydrogeologic information in several areas indicate the presence of geologic materials (i.e., clay, silty/sandy clay, etc.) which may be conducive to the

presence of perched water. This is demonstrated on several figures relating to selected areas and absent in other areas. Areas (i.e., Area 6, Area 7, etc.) where the geology may be conducive to this condition should be reviewed to determine whether sufficient data exists to confirm or deny the existence of perched water. Revise the Work Plan to accommodate this review.

3.7.4 Area 4 - Marshall Plant Waste Pond Area (Pages 3-33 to 3-41)

3.7.4.1 SWMU 4-1: Bottom Fly Ash Landfill Units J-1 and J-2 (Pages 3-33 to 3-40)

23. This section and Figure 3-15 require additional discussion. Page 3-36 indicates that a perched water zone in this area is separated from the landfill materials by a clay layer. This is inconsistent with cross-section A-A on Figure 3-15. The figure shows the water table under the unit in addition to two areas of potentially perched water near TPZ-01 and TPZ-04 where static water levels are indicated. This requires additional discussion regarding the characteristics of this unit. Additionally, cross-section C-C' includes a cross-hatched area adjacent to the Ohio River which is not described in the legend. Since the boring did not reach the water table, discuss how the water level in this area was determined or inferred. Revise this section and figure, as appropriate, to address these issues.

3.7.6 Area 6 - Monochlorobenzene (MCB) Production Area (Pages 3-42 to 3-45)

3.7.6.1 AOC 6-3A: Soils Throughout the MCB Area (Pages 3-43 to 3-45)

24. The first paragraph indicates the presence of a 10-15 foot layer of clay and sandy clay underlying this unit and the second paragraph indicates the presence of till underlain by silty to sandy gravel to 11.5 ft-bgs and fine to coarse sand to 16.5 ft-bgs. The location of the clay and sandy clay layer is not sufficiently defined. Revise the Work Plan to indicate the location of the clay and sandy clay layer with respect to the unit and other layers mentioned. Additionally, discuss the potential for perched water in this area due to the presence of a defined clay and sandy clay layer.

25. The third line in the first paragraph of this section states that the boring logs from MW-7 and MW-8 indicate that the area is underlain by 10 to 15 feet of clay and sand clay. This statement may not be accurate. It is not acceptable to generalize the location of this clay and sandy clay layer based upon two boring logs from wells in the extreme northern corner of the area. Revise this statement to provide additional information supporting this assumption or indicate this condition exists only in the northern corner of this area.

26. In a 1982 preconstruction characterization study of the MCB area, several borings and sample analyses were performed. These analyses reportedly showed elevated levels of organics in the soils at areas within or near the SWMUs in Area 6. However, the DOCC does not discuss these sampling events or results. Provide information on these sampling events and results, and revise the proposed sampling strategy to utilize the results of this study to aid in determining sampling locations at this unit. Revise the Work Plan to include a discussion of these results and to revise the sampling strategy accordingly.

3.8 EXISTING DATA SUMMARY (Page 3-61)

27. The existing data summary leaves many questions unanswered. Throughout Section 3.0, the contention is that production well use has effectively reversed the groundwater flow from the Ohio River to the east toward the plant and more specifically towards discrete production well locations. This conclusion is supported by only two groundwater elevation contour maps from 1988 and 1989. This does not account for the potential contaminant migration in periods prior to or after this mapping. Provide additional historical data, if available, which supports the contention that the production well scheme has effectively contained any contaminant plumes that may be present on the site, or provide for the generation of additional groundwater contour maps necessary to evaluate the facility.

28. Provide information on the practices and operations of lessee's on the PPG properties. Indicate whether any of the current investigations have provided information for those sites and/or on formerly leased sites and whether any of the current or former lessee's have or are performing environmental investigations on the leased PPG property.

3.11 ONGOING ACTIONS (Pages 3-66 and 3-67)

29. This section discusses several areas which are currently undergoing interim actions at the PPG facility. These investigations are in addition to the proposed RFI. The information on pages 3-66 and 3-67 provides only a cursory discussion of these areas and the investigations proposed. Information should be provided in the RFI Work Plan to discuss the scope of these investigations and how the results, if applicable, will tie into the general RFI for the facility. Additionally, discuss how the results of these investigations will be presented, to whom, and whether this data will be used in assessing site-wide conditions during the RFI. Include these submittals and milestones in the project schedule included with the RFI Work Plan. Revise the Work Plan to provide the additional discussion and information requested.

4.0 RFI SCOPE OF WORK

4.2 GENERAL APPROACH

4.2.1 Approach Rationale (Pages 4-1 and 4-2)

30. The approach for the RFI is to install additional wells to aid in defining the nature and extent of contamination and to define groundwater flow and contamination on a site-wide basis. This approach needs to be broadened to ensure the collection of accurate and useful data. First, the existence of groundwater contamination is not in doubt, however, the source and extent of the contamination is in doubt. In addition, an attempt to define the groundwater flow on a site-wide basis will likely be futile unless assurances can be made that the current production well scheme will remain constant, noting that any significant changes affect the flow patterns. Otherwise, any data gathered and used in the delineation of source assessment, groundwater flow direction, plume travel assessment, and as a tool in the location of future monitoring wells may be inaccurate. The first step in resolving these issues is to better define the impact that the operation of the production wells has on the groundwater (flow rates and directions) through the use of multiple well pump tests and tracer dye studies, etc. These tests are proposed as elements of Task 13, but it is more logical to perform these studies earlier so the resulting data can be better used in meeting the objectives of the investigation. However, note that results from these types of investigations would be based upon certain operating conditions related to the production wells which would have to be maintained throughout the RFI process and the Interim Measures (IM) or Corrective Measures (CM) stages. Revise the RFI Work Plan to provide for definition of the groundwater flow regime in relation to production well use at an earlier stage in the investigation (preferable Phases I or II).

31. A number of discrepancies exist between information presented in Table 4-1, Table 5-6, and Tables 5-7 through 5-69. For example: in Table 4-1, the analytes listed for SWMU 5-2 include BTEX while Table 5-6 does not; in Table 4-1 the analytes listed for AOC 5-3A include BTEX which is not included in Table 5-6, and PCBs are not listed in Table 4-1 for AOC 5-3, but are included in Table 5-6. This is only a partial list of the discrepancies; numerous additional discrepancies exist between these tables (Table 4-1 and Table 5-6) and those provided as Tables 5-7 through 5-69 which identify SWMU-specific investigations and constituents. Revise ALL tables, as necessary, to ensure consistency throughout.

4.2.2 Project Phasing (Pages 4-2 and 4-20, Figure 4-1)

32. The project phasing is adequate in overall scope, but certain elements of Phase III should to be performed earlier in the investigation. An RFI should be performed in a way which allows for data in earlier phases to be used in defining the scope of

subsequent phases. In general, the PPG RFI is scoped correctly with the exception of the assessment of the groundwater characteristics, specifically the "hydraulic containment" theory. Significant information is needed to define the groundwater flow direction(s) and rates, as evidenced in the scope of tasks 4, 5, 9, and 13 which relate to hydrogeologic studies. The testing proposed as Task 13 in Phase III (i.e., determining aquifer characteristics, confirming hydraulic containment, and providing data for groundwater flow model) will produce data needed for earlier phases of the investigation. These data are crucial in locating proposed wells, defining contaminant plume locations, and determining or confirming the variability of the hydraulic gradient at varied locations due to the use of the production wells. Revise the scheduling of these tasks to collect these data earlier in the investigation.

33. In addition, Tasks 4, 5, 9, and 13 include either an assessment (tasks 4 and 5), a determination (task 9), or a confirmation (task 13) of the "hydraulic containment" theory. This is not adequate. The condition of hydraulic containment by incidental pumping of the production wells is used as the basis for several facets of this investigation. If hydraulic containment of a plume of contaminated groundwater is occurring at this facility, then this needs to be demonstrated and documented early in the investigation. This is necessary because most of the tasks are based upon the assumption that the contaminated groundwater is hydraulically contained in a limited geographical area by the pumping action of the production wells. This must be confirmed without a doubt by the proposed RFI activities. Revise the RFI Work Plan to provide for the demonstration of the hydraulic containment earlier in the investigation. Include procedures to be used in performing this evaluation.

4.2.3 Risk Assessment Approach (Pages 4-20 to 4-27)

34. The information on page 4-20 states that the primary purpose of the Risk Assessment is to identify the SWMUs and AOCs that require no action, and to identify those that may require monitoring or remediation. This is incorrect. The "primary" purpose of a Risk Assessment is to evaluate the potential risk to populations, both human and ecological, due to current conditions of the environmental media. A secondary result of the Risk Assessment is to allow for a determination of whether the environmental media in an area requires corrective actions or interim action to reduce the risk to acceptable levels. Revise the text to clarify the purpose of the Risk Assessment.

35. Several areas of this section require additional details or clarification. The three groups identified on the bottom of page 4-21 will be used to categorize SWMUs and AOCs, based upon the results of the Risk Assessment, that need further description. Provide details on the criteria to be used to place a SWMU or AOC into either of these three groups and the significance of such placement. Discuss the contaminant levels specific to each group and how the results will be verified or validated to ensure the correct grouping assignments are made.

36. The discussion of the methods used to determine the risks based upon potential contaminant concentrations requires additional detail. Identify methods to be used, levels to be considered significant, and the how the validity of the results will be determined. Revise the Work Plan to provide for the additional discussions specified above.

37. This section states that units will be "recommended" for further action. This statement is vague. Discuss how and to whom this recommendation will be made and the approval process which will occur. Include information on the type of information to be presented in this recommendation, when and in what form it will be presented, to whom it will be presented (i.e., U.S. EPA at a minimum), the appropriate justification for the action, and what steps will be taken once/if these recommendations are approved. Furthermore, any units for which no additional investigation is recommended will also need to obtain approval for their omission from further phases of the investigation. Revise the Work Plan accordingly.

4.2.3.3 Exposure Assessment (Page 4-23 to 4-26)

38. The top of page 3-26 states that there is no opportunity for off-site migration of the groundwater, due to the on-site hydraulic containment. The assumption that there is hydraulic containment has not been definitively proven, thus this statement may not be entirely accurate. Revise the document to remove this statement and provide for the assessment of groundwater as a potential exposure pathway for off-site receptors, until the investigation can substantiate the hydraulic containment theory.

4.2.3.5 Environmental Evaluation (Pages 4-26 and 4-27)

39. A typographical error is present in the second paragraph of page 4-27. The statement indicates that LC_{50} is the lethal concentration for 5 percent of organisms. This is incorrect, the LC_{50} is the lethal concentration for "50" percent of organisms. Revise this discrepancy.

4.4 SITE SPECIFIC DATA NEEDS AND RATIONALE

40. Several inconsistencies exist between the information presented in this section and that contained in Tables 4-1, Table 5-6, and Tables 5-7 through 5-69. Table 4-1 provides the rationale for sample analysis, while Table 5-6 provides a summary of the proposed locations and analytes for soil sample analysis, and Tables 5-7 through 5-69 provide the unit-specific sampling requirements. These tables are not consistent in their approach or the analytes proposed. This is most noticeable when comparing Sections 4.3 and 4.4, which identify the data gaps for each SWMU or AOC, and

Section 5.3.1.3, which presents the proposed investigation. Oftentimes the proposed investigation does not provide for filling the data gaps. Revise the Work Plan to clarify the exact purpose of each table, and revise these sections and tables to ensure consistency.

41. The suggested sampling strategy for several of the SWMUs and AOCs to be investigated includes the collection of deep subsurface samples, if the shallow subsurface soil samples are deemed to be "of concern". However, no specific information is presented to define what levels will be of concern. Revise the Work Plan to indicate the criteria to be used to determine subsurface soil samples which are "of concern". Include the procedures to be used to determine the need for additional deep subsurface samples, when this will be performed, who will review and authorize the additional sample, or lack thereof, and how and to whom these results will be presented.

    In addition, several of the sampling strategies (specifically in Areas 8 and 11) include general analytical parameters (i.e., Ph, chlorides, sodium, TPH, TOX) as indicators for requiring additional sampling at a particular unit. However, no specific information is presented to define what levels will be of concern. Revise the Work Plan to indicate the criteria to be used to determine areas where additional sampling will be performed. Include the procedures to be used to determine the need for additional deep subsurface samples, when this will be performed, who will review and authorize the additional sample, or lack thereof, and how and to whom these results will be presented.

42. The Work Plan does not take into account the physical characteristics of a particular SWMU or AOC when defining the proposed investigation. Sampling strategies in Section 5.3.1.3 of the Work Plan propose the collection of samples from pre-determined areas at a SWMU or AOC with no concession for restrictions imposed by the physical characteristics of a unit (i.e., depth of fill, cracks in pavement, caps, liners, etc.) or for screening split spoon samples with an organic vapor analyzer (OVA) at regular intervals to allow for the collection of biased samples based upon the OVA readings. Revise the RFI Work Plan to allow sampling based upon a units physical feature and for biased sampling at SWMUs or AOCs during confirmatory sampling activities.

4.4.1 Site-wide Groundwater (Pages 4-34 to 4-36)

43. The RFI data needs to include a significant amount of information on the characteristics and quality of the aquifer(s) on the site. The proposed investigation may be adequate to obtain this information, but the crux of the investigation related to these issues is proposed in Phase III, Task 13. The timing of this task is not appropriate. This information should be a significant driver for several facets of the

presence of perched water. This is demonstrated on several figures relating to selected areas and absent in other areas. Areas (i.e., Area 6, Area 7, etc.) where the geology may be conducive to this condition should be reviewed to determine whether sufficient data exists to confirm or deny the existence of perched water. Revise the Work Plan to accommodate this review.

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3.7.4.1 SWMU 4-1: Bottom Fly Ash Landfill Units J-1 and J-2 (Pages 3-33 to 3-40)

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4.2.1 Approach Rationale (Pages 4-1 and 4-2)

30. The approach for the RFI is to install additional wells to aid in defining the nature and extent of contamination and to define groundwater flow and contamination on a site-wide basis. This approach needs to be broadened to ensure the collection of accurate and useful data. First, the existence of groundwater contamination is not in doubt, however, the source and extent of the contamination is in doubt. In addition, an attempt to define the groundwater flow on a site-wide basis will likely be futile unless assurances can be made that the current production well scheme will remain constant, noting that any significant changes affect the flow patterns. Otherwise, any data gathered and used in the delineation of source assessment, groundwater flow direction, plume travel assessment, and as a tool in the location of future monitoring wells may be inaccurate. The first step in resolving these issues is to better define the impact that the operation of the production wells has on the groundwater (flow rates and directions) through the use of multiple well pump tests and tracer dye studies, etc. These tests are proposed as elements of Task 13, but it is more logical to perform these studies earlier so the resulting data can be better used in meeting the objectives of the investigation. However, note that results from these types of investigations would be based upon certain operating conditions related to the production wells which would have to be maintained throughout the RFI process and the Interim Measures (IM) or Corrective Measures (CM) stages. Revise the RFI Work Plan to provide for definition of the groundwater flow regime in relation to production well use at an earlier stage in the investigation (preferable Phases I or II).

31. A number of discrepancies exist between information presented in Table 4-1, Table 5-6, and Tables 5-7 through 5-69. For example: in Table 4-1, the analytes listed for SWMU 5-2 include BTEX while Table 5-6 does not; in Table 4-1 the analytes listed for AOC 5-3A include BTEX which is not included in Table 5-6, and PCBs are not listed in Table 4-1 for AOC 5-3, but are included in Table 5-6. This is only a partial list of the discrepancies; numerous additional discrepancies exist between these tables (Table 4-1 and Table 5-6) and those provided as Tables 5-7 through 5-69 which identify SWMU-specific investigations and constituents. Revise ALL tables, as necessary, to ensure consistency throughout.

4.2.2 Project Phasing (Pages 4-2 and 4-20, Figure 4-1)

32. The project phasing is adequate in overall scope, but certain elements of Phase III should to be performed earlier in the investigation. An RFI should be performed in a way which allows for data in earlier phases to be used in defining the scope of

subsequent phases. In general, the PPG RFI is scoped correctly with the exception of the assessment of the groundwater characteristics, specifically the "hydraulic containment" theory. Significant information is needed to define the groundwater flow direction(s) and rates, as evidenced in the scope of tasks 4, 5, 9, and 13 which relate to hydrogeologic studies. The testing proposed as Task 13 in Phase III (i.e., determining aquifer characteristics, confirming hydraulic containment, and providing data for groundwater flow model) will produce data needed for earlier phases of the investigation. These data are crucial in locating proposed wells, defining contaminant plume locations, and determining or confirming the variability of the hydraulic gradient at varied locations due to the use of the production wells. Revise the scheduling of these tasks to collect these data earlier in the investigation.

33. In addition, Tasks 4, 5, 9, and 13 include either an assessment (tasks 4 and 5), a determination (task 9), or a confirmation (task 13) of the "hydraulic containment" theory. This is not adequate. The condition of hydraulic containment by incidental pumping of the production wells is used as the basis for several facets of this investigation. If hydraulic containment of a plume of contaminated groundwater is occurring at this facility, then this needs to be demonstrated and documented early in the investigation. This is necessary because most of the tasks are based upon the assumption that the contaminated groundwater is hydraulically contained in a limited geographical area by the pumping action of the production wells. This must be confirmed without a doubt by the proposed RFI activities. Revise the RFI Work Plan to provide for the demonstration of the hydraulic containment earlier in the investigation. Include procedures to be used in performing this evaluation.

4.2.3 Risk Assessment Approach (Pages 4-20 to 4-27)

34. The information on page 4-20 states that the primary purpose of the Risk Assessment is to identify the SWMUs and AOCs that require no action, and to identify those that may require monitoring or remediation. This is incorrect. The "primary" purpose of a Risk Assessment is to evaluate the potential risk to populations, both human and ecological, due to current conditions of the environmental media. A secondary result of the Risk Assessment is to allow for a determination of whether the environmental media in an area requires corrective actions or interim action to reduce the risk to acceptable levels. Revise the text to clarify the purpose of the Risk Assessment.

35. Several areas of this section require additional details or clarification. The three groups identified on the bottom of page 4-21 will be used to categorize SWMUs and AOCs, based upon the results of the Risk Assessment, that need further description. Provide details on the criteria to be used to place a SWMU or AOC into either of these three groups and the significance of such placement. Discuss the contaminant levels specific to each group and how the results will be verified or validated to ensure the correct grouping assignments are made.

36. The discussion of the methods used to determine the risks based upon potential contaminant concentrations requires additional detail. Identify methods to be used, levels to be considered significant, and the how the validity of the results will be determined. Revise the Work Plan to provide for the additional discussions specified above.

37. This section states that units will be "recommended" for further action. This statement is vague. Discuss how and to whom this recommendation will be made and the approval process which will occur. Include information on the type of information to be presented in this recommendation, when and in what form it will be presented, to whom it will be presented (i.e., U.S. EPA at a minimum), the appropriate justification for the action, and what steps will be taken once/if these recommendations are approved. Furthermore, any units for which no additional investigation is recommended will also need to obtain approval for their omission from further phases of the investigation. Revise the Work Plan accordingly.

4.2.3.3 Exposure Assessment (Page 4-23 to 4-26)

38. The top of page 3-26 states that there is no opportunity for off-site migration of the groundwater, due to the on-site hydraulic containment. The assumption that there is hydraulic containment has not been definitively proven, thus this statement may not be entirely accurate. Revise the document to remove this statement and provide for the assessment of groundwater as a potential exposure pathway for off-site receptors, until the investigation can substantiate the hydraulic containment theory.

4.2.3.5 Environmental Evaluation (Pages 4-26 and 4-27)

39. A typographical error is present in the second paragraph of page 4-27. The statement indicates that LC_{50} is the lethal concentration for 5 percent of organisms. This is incorrect, the LC_{50} is the lethal concentration for "50" percent of organisms. Revise this discrepancy.

4.4 SITE SPECIFIC DATA NEEDS AND RATIONALE

40. Several inconsistencies exist between the information presented in this section and that contained in Tables 4-1, Table 5-6, and Tables 5-7 through 5-69. Table 4-1 provides the rationale for sample analysis, while Table 5-6 provides a summary of the proposed locations and analytes for soil sample analysis, and Tables 5-7 through 5-69 provide the unit-specific sampling requirements. These tables are not consistent in their approach or the analytes proposed. This is most noticeable when comparing Sections 4.3 and 4.4, which identify the data gaps for each SWMU or AOC, and

Section 5.3.1.3, which presents the proposed investigation. Oftentimes the proposed investigation does not provide for filling the data gaps. Revise the Work Plan to clarify the exact purpose of each table, and revise these sections and tables to ensure consistency.

41. The suggested sampling strategy for several of the SWMUs and AOCs to be investigated includes the collection of deep subsurface samples, if the shallow subsurface soil samples are deemed to be "of concern". However, no specific information is presented to define what levels will be of concern. Revise the Work Plan to indicate the criteria to be used to determine subsurface soil samples which are "of concern". Include the procedures to be used to determine the need for additional deep subsurface samples, when this will be performed, who will review and authorize the additional sample, or lack thereof, and how and to whom these results will be presented.

    In addition, several of the sampling strategies (specifically in Areas 8 and 11) include general analytical parameters (i.e., Ph, chlorides, sodium, TPH, TOX) as indicators for requiring additional sampling at a particular unit. However, no specific information is presented to define what levels will be of concern. Revise the Work Plan to indicate the criteria to be used to determine areas where additional sampling will be performed. Include the procedures to be used to determine the need for additional deep subsurface samples, when this will be performed, who will review and authorize the additional sample, or lack thereof, and how and to whom these results will be presented.

42. The Work Plan does not take into account the physical characteristics of a particular SWMU or AOC when defining the proposed investigation. Sampling strategies in Section 5.3.1.3 of the Work Plan propose the collection of samples from pre-determined areas at a SWMU or AOC with no concession for restrictions imposed by the physical characteristics of a unit (i.e., depth of fill, cracks in pavement, caps, liners, etc.) or for screening split spoon samples with an organic vapor analyzer (OVA) at regular intervals to allow for the collection of biased samples based upon the OVA readings. Revise the RFI Work Plan to allow sampling based upon a units physical feature and for biased sampling at SWMUs or AOCs during confirmatory sampling activities.

4.4.1 Site-wide Groundwater (Pages 4-34 to 4-36)

43. The RFI data needs to include a significant amount of information on the characteristics and quality of the aquifer(s) on the site. The proposed investigation may be adequate to obtain this information, but the crux of the investigation related to these issues is proposed in Phase III, Task 13. The timing of this task is not appropriate. This information should be a significant driver for several facets of the

RFI, and as much information as possible should be gathered in earlier tasks to adequately drive and support future RFI activities. Revise the Work Plan by adjusting the proposed RFI schedule to expedite the assessment of the variability of groundwater flow.

44. This section states that deep wells will be installed to evaluate vertical groundwater flow. This data will be very important in the determination of hydraulic containment, but procedures for the determination of the vertical hydraulic gradients has not been provided. Revise the Work Plan to provide procedures for the determination of vertical groundwater flow.

4.4.2 Surface Water and Sediments (Pages 4-36 and 4-37)

45. It is not acceptable to defer the collection of surface water and sediment samples based upon the assumption that the facility maintains hydraulic control of the groundwater. Although contamination of surface waters and sediments via contact with contaminated groundwater may be unlikely in this instance, it is not implausible that groundwater may not be the only route of contamination. Revise the Work Plan to provide an assessment during the RFI of surface water and sediments.

4.4.4 All Sewers, Trenches, and Drains Included in the RFI (Pages 4-38 to 4-40)

46. The soil sampling involved in the investigation of the sewers, trenches, and drains will reportedly be performed at "strategic" locations. This is vague and additional clarification of "strategic" locations is required. A number of locations associated with the sewers, trenches and drains have the potential to have released to the environment, based upon information presented in Table 4-1. This table identifies these sewer systems as having managed substantial quantities of hazardous constituents. Revise the Work Plan to include additional information on the rationale for sample location selection. Include the depth, location, and construction materials as indicated; but also include areas with high potential for releases. (e.g., catch basins, bends, joints, areas adjacent to sources, etc.)

47. The information in this section is incomplete. The data needs for these units should also include the following: historic upgrades to these systems and the reasons for the upgrade (i.e., leaking, deterioration of system, etc.), age, materials of constructions, presence of catch basins, areas of water or material accumulation, and location specifics. This information is required to accurately define the potential risk associated with these units and to determine the possibility that releases have or may reach the groundwater. Revise the Work Plan to provide the additional details requested above.

4.4.5 Area 2 - Bottom/Fly Ash Area (Pages 4-40 to 4-44)

4.4.5.2 SWMU 2-2: Oil Storage Tank Area (Pages 4-43 and 4-44)

48. This section proposes an investigation of the soils for oil and oil-related constituents through analysis for TPH. Since the tanks were removed and no confirmatory sampling was performed, it would be advisable to include the expanded analyte list for the initial sampling round. Revise the Work Plan to provide for sampling soils from this area for TCL VOCs and TCL SVOCs.

4.4.6 Area 3 - Ammonia Process Area (Pages 4-44 to 4-48)

4.4.6.1 SWMU 3-1: Oil Water Separator Area (Pages 4-45 and 4-46)

49. This section proposes an investigation of oil and oil-related constituents in the soil through analysis for TPH. This unit is still in operation, significant soil staining has been observed, and no prior sampling has been performed. Therefore, releases have occurred and TCL VOCs and TCL SVOCs should be added to the analyte list for the initial sampling round. Revise the Work Plan to provide for sampling soils from this area for TCL VOCs and TCL SVOCs and to perform a nature and extent investigation instead of confirmatory sampling.

4.4.6.2 SWMU 3-2: Vehicle Repair Facility (page 4-46 to 4-48)

50. A 1992 site visit noted visible staining on the soils at the Vehicle Repair Facility which was reportedly due to either releases of waste oils or cleaning solvents. The proposed confirmatory investigation calls for the analysis of samples for TPH. Since a release to the environment is confirmed, a confirmatory sampling plan is not warranted but instead a nature and extent investigation should be proposed at this location. In addition, BTEX and TPH may not detect all potentially present constituents and the proposed analysis should also include TCL VOCs and SVOCs. Revise the Work Pan to address the issues discussed above.

4.4.7 Area 4 - Marshall Plant Waste Area (Pages 4-48 to 4-52)

4.4.7.2 SWMU 4-2: Marshall Plant Waste Pond (Pages 4-50 to 4-52)

51. The Marshall Plant Waste Pond is reported to be a major contributor to contamination at the site. The effects if any of the production wells on the groundwater flow in the vicinity of this unit need to be defined. This is significant because groundwater plumes under the facility are already intermingled, and if the Marshall Plant Waste

Pond has contributed or is contributing to this contamination, then the specific contributions to the plumes and the groundwater plume flow patterns may vary significantly. Revise the Work Plan to expand the data assessment in this area to include the effects of production well usage on plumes of groundwater contamination.

4.4.8 Area 5 - Marshall Plant Product Area (Pages 4-52 to 4-59)

4.4.8.5 AOC 5-3A: Gasoline Storage Facility (Pages 4-58 and 4-59)

52. This site includes storage of gasoline over an earthen surface with no previous investigations at this unit. The potential exists for VOCs/BTEX constituents to be present if a release has occurred. BTEX constituents are listed in Table 4-1 but not in Table 5-6. Ensure that BTEX analysis will be performed on samples from this area.

4.4.11 Area 8 - Chlorine and Caustic Process Area (Pages 4-72 to 4-91)

4.4.11.14 AOC 8-4A: Graphite Cell Production Area (Pages 4-88 and 4-89)

53. This section states that releases of lead, tin, and mastic are know to have occurred in this area; however, information on the nature and extent of these releases is not provided. Revise the Work Plan to provide information on the number and timing of these releases, the material released, cleanup and disposal information, and available analytical results.

4.4.12 Area 9 - Power Plant Area (Pages 4-91 to 4-96)

4.4.12.2 SWMU 9-2: Former Bottom/Fly Ash Lagoon (Pages 4-93 and 4-94)

54. The RFI investigation for this unit is proposed for soils adjacent to the unit. In addition, the lagoon was recently filled in with river dredgings of an unknown quality. The potential for migration of hazardous constituents from this unit has not been discussed and may be enhanced or diminished by the placement of river dredgings. Indicate whether any testing was performed on the river dredgings prior to placement. Provide analytical results if available for the dredgings or propose the collection of soil/sediment samples of this material for an expanded list of analytical parameters in addition to the samples proposed for collection adjacent to the unit.

4.4.13 Area 10 - Inorganics Process Area (Pages 4-96 to 4-99)

4.4.13.2 AOC 10-1A: Soil in Inorganics Area (Pages 4-98 and 4-99)

55. A typographical error seems to be present in this section. A statement in the first paragraph states that monitoring wells will be installed to evaluate site-wide groundwater conditions within Area 6. It is assumed this is an error that should be corrected. If the statement is correct; provide details on how wells in Area 6 will provide information on Area 10, which is approximately 2,000 feet to the southeast. Revise the Work Plan accordingly.

4.5 RFI TASK 9 - GROUNDWATER FLOW MODEL (Pages 4-112 and 4-113)

56. The use of the proposed model at this site is based upon steady state conditions. However, steady state conditions are not assured at the site and cannot be assumed. It is possible that turning off, starting, abandoning, or modifying flow of any one of the 27 active production wells could significantly impact the results of groundwater modeling. Revise the Work Plan to provide information on how the impact of the production well operations will be addressed during the modeling and whether the MODFLOW model is most appropriate, considering the site conditions. This is not currently proposed until the performance of Task 13.

57. Current information on groundwater at the site does not take into account the variability imposed through the use of production wells. The last statement in the second paragraph on page 4-112 states that sufficient information exists to complete the steady state groundwater calibration prior to installing Phase III monitoring wells. This has not been adequately proven, and no specific information has been presented to illustrate current groundwater flow regimes. If this information is not currently available, it must be collected prior to initiating any detailed hydrogeologic assessments or modeling. Task 13 in Phase III includes the collection and assessment of a significant volume of data with respect to the current groundwater flow and the variable influences of the production well use. It is recommended that these data on current conditions (i.e., Task 13) be collected in Phase II to allow for use in assessing the groundwater flow and quality data and in the placement of additional monitoring wells. Revise the Work Plan accordingly.

4.6 REPORTING AND DATA ANALYSIS (Pages 4-113 to 4-118)

58. This section discusses the compilation and evaluation of data resulting from the Phase I and Phase II investigations. However, no information is provided on the mechanism(s) for presenting the results of all of these phases or proposals for future phases to the U.S. EPA, for their review and approval. The proposed time line on

Figure 6-2 identifies a block of time between phases for EPA review, but does not provide details on the information to be reviewed. Revise the Work Plan to provide additional details on the scope and content of the submittals (i.e., Phase I Interim Report, Phase III Work Plan, etc.) which will be made to EPA. Describe the format of these submittals and how these will impact future phases of the investigation. Include information on who will approve the results presented in these submittals, to allow for progression to future Phases or Tasks in the RFI.

5.0 FIELD SAMPLING PLAN

5.1 GENERAL FIELD PROCEDURES (Pages 5-1 to 5-6)

5.1.1 Identifying and Surveying Sampling Locations (Page 5-3)

59. The locations of all sampling points will reportedly be surveyed and approved by PPG personnel and/or local utility companies to ensure underground objects or utilities are not encountered. Any requirements to relocate a sampling location will reportedly be directed by PPG or the utility company without input from an ICF Kaiser Engineer or Geologist or the U.S. EPA Project Manager. This is not acceptable. At a minimum, the ICF Kaiser representative familiar with the facility and the scope of the investigation within a certain area should be consulted on appropriate alternate locations. Additionally, the U.S. EPA Project Manager must be consulted prior to any significant relocation (i.e., any relocation that may affect the quality or reliability of the analytical results) of sampling location(s) or deviations from the Work Plan. This will ensure that the new location will provide results representative of the unit and of the original location and will result in data acceptable to U.S. EPA. Revise the Work Plan to include ICF Kaiser and/or U.S. EPA Project Manager, if appropriate, in any decisions regarding sample site relocation.

60. The selection of sampling locations is currently not based upon knowledge of known or suspected releases that may have occurred at a specific area. The selection of biased sample locations is required in these areas to allow for a nature and extent of release investigation as opposed to a confirmatory sampling investigation. Revise the Work Plan accordingly to allow for the collection of biased samples whenever possible.

Additionally, many SWMUs or AOCs are located in areas that are currently paved with concrete or asphalt. These areas will need to be investigated based upon knowledge of past operations, regardless of the accessibility of the area. In circumstances where concrete or asphalt covers the most appropriate sampling location(s), samples should be taken under the paving materials. Revise the Work Plan to provide procedures for the collection of sampling in areas where concrete or asphalt may obscure the most appropriate sampling location. Include procedures to

allow for focusing investigations in paved areas where the concrete or asphalt may be cracked, broken, pitted, or otherwise breached and would allow for a migration pathway for releases.

5.2 PHASE I DATA COLLECTION

5.2.2 RFI Task 2 - Soil Gas Surveys (Pages 5-9 to 5-17)

61. The procedures and equipment described in this section and Section 5.5 of the QAPjP require additional detail. The type of soil gas probes to be used has not been defined. Indicate whether the probes will be actual soil gas probes which are screened or slotted along the sides to allow gas to enter the probe, or whether a piece of hollow stainless steel tubing will be used. If the hollow stainless steel tubing will be used, then the procedure must include retraction of the probe after insertion of approximately 1 foot to allow for the formation of a cavity from which soil gas can be extracted. In addition, a hollow stainless steel tube would require the use of an inert drive point, which aids in the insertion of the tube and prevents the tube from being plugged upon insertion. This point remains in the ground when the hollow probe is retracted. Provide additional detail on the type of probe(s) to be used.

    In addition, the list of soil gas survey constituents is very limited. Revise the Work Plan to provide further discussion on the parameter list to justify the exclusion of all TCL VOCs not listed.

62. The results of the soil gas sampling will reportedly be used in certain circumstances to potentially relocate soil sampling locations. The criteria to be used to determine more appropriate sampling locations has not been provided. Revise the Work Plan to include information on how the data will be reviewed and used to relocate soil samples to more appropriate areas (i.e., biased sampling) determined by the soil gas survey results.

5.2.3 RFI Task 3 - Evaluate Existing Monitoring Wells (Pages 5-17 to 5-19)

63. The evaluation of the existing wells will provide an indication as to the usefulness of several of the wells at the site for investigative purposes. This section does not include information on the criteria to be used in this evaluation and the method that this information will be presented. The data gathered and any determinations made should be provided to U.S. EPA for review. Revise this section to include the definitive criteria to be used in this evaluation and indicate the nature, contents, and format for the evaluation results.

5.2.4 RFI Task 4 - Gauge Production Well Flow Rates (pages 5-19 to 5-21)

64. The historical and current flow rates of the production wells are very important to this investigation, especially in providing documentation on current and historical hydraulic containment. Provide a discussion on how the data from this task will be used to define and document current and historical hydraulic control.

5.2.6 RFI Task 6 - Locate Map and Inspect Sewers, Trenches and Drains (Page 5-27)

65. The justification provided for the lack of any integrity testing of these units is not adequate. Provide additional information on the operation of these units to support the lack of integrity testing through the use of video or other means. In addition, the statement in the second to last paragraph on page 5-27 states that the Phase II investigation will determine the integrity of these units. This is incorrect since no integrity testing is proposed. Revise the Work Plan to include additional information on integrity testing of these units and remove the statement in the second to last paragraph.

5.3 PHASE 2 DATA COLLECTION (Pages 5-28 to 5-216)

66. This main section reportedly contains a description of all activities to be performed during Phase II of the investigation. However, the last subsection, on page 5-216 is related to RFI Task 8. No section is included to discuss the details of Task 9 - Groundwater modeling, which is briefly discussed in Section 4.5. Include a detailed discussion related to Task 9, which supports the investigative activities proposed and the uses of the resulting data.

67. There are several inconsistencies between the investigation proposed in the following subsections and the information needs identified in Sections 4.3 and 4.4. Additionally, confirmatory sampling is proposed at units which have known or suspected releases of hazardous constituents. These units should undergo a nature and extent investigation instead of a confirmatory type investigation. This involves biased sampling around the perimeter of the unit, or near known or suspected release areas, instead of within the unit itself. Review Sections 4.3, 4.4, and 5.3.1.3 to ensure consistency between data needs and the proposed investigation and to ensure the performance of the most appropriate (confirmatory/waste characterization vs. nature and extent) investigation.

5.3.1 RFI Task 7 - Confirmatory Test Borings and Soil Sampling (Pages 5-28 to 5-216)

5.3.1.3 Proposed Locations and Analysis (Pages 5-29 to 5-216)

68. The investigation at SWMU 4-1 proposes soil borings to collect samples for VOC/SVOCs analysis at two locations. One of these locations will be based upon the soil gas survey and will be placed in an area with elevated VOC readings and the other will be placed in an area with no VOC readings. This approach may not be acceptable for the performance of a Risk Assessment at this unit, since one of the samples will potentially result in no elevated VOC readings. Provide the rational for this sampling approach, specifically with respect to the Risk Assessment for this unit, or revise the sampling approach to collect biased samples at this unit.

69. The investigation of the Area 2 Bottom/Fly Ash Units J-3, J-4, and J-5 include the analysis of soils for TAL inorganics, TCLP Metals, Ph, and Boron. Polynuclear Aromatic Hydrocarbons (PAHs) are also a common constituent in fly ash. Revise the proposed analytes to include PAHs at the fly ash units. This potentially applies to SWMU 9-1 as well.

70. The investigation at AOC 5-2A is based upon known releases to the soil as noted by staining of area soils. Since this unit manages fuel oil, the list of analytes proposed should include PAHs. Revise the Work Plan accordingly.

71. Figure 5-20 is reported to show the proposed locations for borings at SWMU 5-6. This figure does not provide these boring locations. Revise this figure to indicate the locations of the four borings proposed for this unit. Additionally, the proposed analytes (TCL VOCs) for SWMU 5-6 are not adequate. Include TCL SVOCs, TCL PCBs and metals, at a minimum, or provide additional justification for only analyzing for TCL VOCs.

72. Figure 5-13 does not provide the specific unit boundaries associated with units J-3, J-4, and J-5. Revise this figure to identify the known or approximated boundaries of these units.

73. The investigation proposed at SWMU 6-3 will reportedly (as stated on page 5-100) use geotechnical samples collected at SWMU 6-1 in the assessment of the general geotechnical parameters in this area. However, the investigation at SWMU 6-1 does not provide for the collection of this information. Revise the Work Plan to provide for the collection of geotechnical samples at one or both of these units.

74. The investigation proposed at SWMU 6-7 requires sampling at the former BHC Pile. The pile has been removed and no apparent unit boundaries have been defined. A discussion should be included on how the sampling locations will be determined, due to the removal of the pile of BHC and the apparent lack of any definitive boundaries.

Revise the Work Plan to include procedures for defining the unit boundaries prior to initiation of sampling.

75. AOC 6-1A is a storage and containment area with a sump, however, the proposed investigation does not provide the location of the sump nor propose any sampling in its vicinity. Revise the text and figure to include information on the sump at this unit, and propose the collection of samples in the vicinity of the sump.

76. This document states in Sections 3.7.8.2 and 4.4.11.9 that mercury has been detected at elevated concentrations around SWMU 8-18, and is potentially attributable to this SWMU. The proposed investigation at this unit calls for the collection of samples around the perimeter of the unit. This approach should be broadened to include additional biased sampling in areas where mercury has been detected during past sampling to allow for an assessment of the nature and extent of the contamination. Revise the Work Plan accordingly.

77. The investigation for SWMU 9-2 does not include the collection of any waste samples to be used to characterize the waste at this unit, nor are historical data presented. The former and current characteristics of the wastes within this unit should be determined. Revise the Work Plan to provide for the collection of waste samples or include information on the wastes managed at this unit.

78. The investigation at SWMU 10-1 is incomplete. This unit is reportedly located over 50 to 60 feet of fill. The collection of samples from only one boring in the center of the unit is not adequate to characterize the wastes or fill material nor is the current analyte list extensive enough based upon the limited information at this unit. Additional sampling within the unit boundaries should be performed to allow for an assessment of the characteristics of the wastes within this unit and the fill material underlying the pond. Revise the document to provide for the collection of these additional samples and include additional parameters for general analysis. Alternatively, provide information on the waste streams deposited into this unit as a method for characterizing the wastes within the unit.

79. The investigation proposed at SWMU 13-3 requires sampling at the site of a former BHC Storage Pile. The pile has been removed and no apparent unit boundaries have been defined. A discussion should be included on how the sampling location will be determined due to the removal of the pile of BHC and the apparent lack of any definitive boundaries. Revise the Work Plan to include procedures for defining the unit boundaries prior to initiation of sampling.

80. The information regarding the sampling approach at AOC 14-2A is unclear. Page 5-213 states that six samples (from unspecified soil regions) will be collected from three borings and, in addition, shallow subsurface (3-5 ft bgs) samples will be collected from two borings, while all boring will have surface samples collected. The text

seems to indicate the collection of samples from three borings while Figure 5-61 identifies five borings. If the sample collection will occur from five borings, then the text and figure must identify the soil region for the six samples from these three borings and the boring locations, as well as which borings will be used for shallow subsurface sample collection.

81. Several of the sampling locations are concrete or asphalt paved. However, the sampling strategy does not include details on the collection of samples from areas where pavement exist. The areas underlying concrete or asphalt pavement may be the most appropriate sample location but may not be sampled due to the extra effort involved in sample collection of this sort. Revise the Work Plan to include procedures for the collection of samples from under concrete or asphalt paved areas as appropriate. Some of the SWMUs or AOCS where this may be an issue include: SWMU 6-1, SWMU 8-4, SWMU 8-14, and numerous other areas.

82. Figure 5-52 is reported to show the proposed locations for borings at AOC 10-1A. This figure does not provide these boring locations. Revise this figure to indicate the locations of the borings proposed for this unit.

5.4 PHASE 3 DATA COLLECTION

5.4.1 RFI Task 10 - Surface and Subsurface Soil Sampling (Page 5-217)

83. The focus of the Phase III soils investigation will be based upon the results of Phase II investigations. This is accurate; however, in this instance the placement of additional sample locations should be biased towards areas of known contamination. For example, if a SWMU requires additional investigation in Phase III due to contamination detected in 2 out of 4 borings taken in Phase II, this section indicates that the entire SWMU will be included in the grid used to determine "random" sample locations. This is not the most appropriate method for choosing additional sample locations. Additional samples should be focussed in the areas nearest the 2 borings which exhibited contamination. Revise the proposed procedures to ensure the biased sampling of soils in Phase III.

5.4.2 RFI Task 11 - Monitoring Well Installation (Pages 5-217 to 5-223, Figure 5-62, Table 5-70)

84. This section, figure, and table provide information on the proposed locations of the additional monitoring wells. It is acceptable that the actual placement may vary slightly, based upon the results of the Phase II investigation; however, any modifications to the proposed placement of these wells must be approved by the U.S. EPA Project Manager prior to installation. Revise the Work Plan to reflect this

approval process.

85. Figure 5-62 does not include the location of wells MW-224S, MW-225S, and MW-226S, which are proposed for installation in Area 4. Revise the Figure to include the proposed locations of these wells.

86. In addition, the wells proposed for Area 1 to assess background groundwater conditions at the facility are relatively close to current production areas, with the exception of MW-202 and MW-202D. The placement of background wells in areas directly adjacent to production areas may not ensure groundwater that is unaffected by contamination. Due to the variability of groundwater flow, these wells should be assessed after installation to ensure they truly provide indications of background groundwater quality. Revise the Work Plan to include this assessment and any contingencies that may be necessary if background quality is in question.

87. Additionally, Section 3.7.1 (first paragraph, page 3-29) indicates that the fine-grained material, which underlies the perched aquifer, is present in Area 1. However, wells to monitor the perched water will only be installed in Areas 2 and 4. Discuss how background concentrations will be established for the perched water and how the lateral and vertical extent of these zones will be established. Revise the Work Plan to address these issues and indicate whether background wells in the perched water table, if applicable, in Area 1 would be warranted.

88. The background wells designated MW-202 and MW-202D may potentially be influenced by recharge from the Ohio River, due to their proximity near the river. This condition would not be appropriate for background wells and must be addressed. Revise the Work Plan to address these issues or provide for the relocation of these wells to areas not directly influenced by recharge to groundwater from the Ohio River.

89. The potential for heaving sands at the site has not been adequately discussed. Indicate the potential for this phenomena to occur site-wide and provide additional discussion of the procedures to be used to counter its effect. Include information on the collection of subsurface samples in areas with heaving sands and discuss an alternative to the use of a wooden plug during drilling operations. Revise the Work Plan to address these issues.

5.4.2.3 Well Installation (Pages 5-220 to 5-222)

90. The installation of additional wells at the site calls for the use of a hollow stem auger (HSA) with a minimum 10-inch outside diameter and completion of the well with 2-inch PVC. Discuss the reasons for using a 10-inch OD HSA for a well casing of 2 inches. In addition, discuss the suitability of using PVC in the wells in areas where

significant levels or organic contamination is present or potentially present. Revise the Work Plan to address these issues.

5.4.2.4 Well Development (Pages 5-222 to 5-223)

91. The development of the wells will reportedly continue until turbidity is below 50 NTUs or until a maximum of 150 gallons has been removed. The development of wells should be performed until parameters (i.e., NTUs) stabilize or until 5 well volumes, inclusive of the annular region, have been removed. Due to the potential for a thick water column and the potentially large volume of water within the annulus, it is conceivable that it may require the removal of more than 150 gallons to achieve adequate development. Revise the Work Plan to remove the 150 gallon maximum, or provide justification for its use.

92. Additionally, the use of 50 NTUs as a target concentration for use during well development may not be appropriate. A limit of 5 NTUs is a more appropriate indicator of parameter stabilization in areas of good water quality. This may vary due to the general quality (turbidity) of the area's groundwater. Revise the document to use this limit or justify the use of 50 NTUs based upon achievable levels for the area.

5.4.3 RFI Task 12 - Groundwater Sampling

5.4.3.3 Sample Collection (Page 5-228)

93. The collection of groundwater samples will be performed using a stainless steel bailer. Ensure that this bailer is a pre-decontaminated bailer, preferably dedicated to the specific well, as indicated in Section 5.3 of the QAPjP. Note that Section 5.3 of the QAPjP states that field decontamination of bailers is not allowed. Revise this section to provide for use of a bailer dedicated to a specific well or at a minimum the use of a pre-decontaminated bailer for sample collection.

6.0 PROJECT MANAGEMENT

6.2 PROJECT RESPONSIBILITIES (Pages 6-2 to 6-6)

6.2.1 Prime Contractor Personnel (Pages 6-2 to 6-5)

94. The statement in the first paragraph of this section is misleading. It states that ICF Kaiser Engineers has tentatively been selected as the prime contractor. Indicate whether this statement is correct or whether ICF Kaiser is likely to remain as the prime. Note that any changes in project personnel (i.e., different prime contractor

and/or personnel) may require approval from the U.S. EPA, including contractor personnel and any revised documents that would need to be submitted. (i.e., QAPjP, Project Management Plan, Health and Safety Plan, etc.) Clarify this discrepancy.

RFI, and as much information as possible should be gathered in earlier tasks to adequately drive and support future RFI activities. Revise the Work Plan by adjusting the proposed RFI schedule to expedite the assessment of the variability of groundwater flow.

44. This section states that deep wells will be installed to evaluate vertical groundwater flow. This data will be very important in the determination of hydraulic containment, but procedures for the determination of the vertical hydraulic gradients has not been provided. Revise the Work Plan to provide procedures for the determination of vertical groundwater flow.

4.4.2 Surface Water and Sediments (Pages 4-36 and 4-37)

45. It is not acceptable to defer the collection of surface water and sediment samples based upon the assumption that the facility maintains hydraulic control of the groundwater. Although contamination of surface waters and sediments via contact with contaminated groundwater may be unlikely in this instance, it is not implausible that groundwater may not be the only route of contamination. Revise the Work Plan to provide an assessment during the RFI of surface water and sediments.

4.4.4 All Sewers, Trenches, and Drains Included in the RFI (Pages 4-38 to 4-40)

46. The soil sampling involved in the investigation of the sewers, trenches, and drains will reportedly be performed at "strategic" locations. This is vague and additional clarification of "strategic" locations is required. A number of locations associated with the sewers, trenches and drains have the potential to have released to the environment, based upon information presented in Table 4-1. This table identifies these sewer systems as having managed substantial quantities of hazardous constituents. Revise the Work Plan to include additional information on the rationale for sample location selection. Include the depth, location, and construction materials as indicated; but also include areas with high potential for releases. (e.g., catch basins, bends, joints, areas adjacent to sources, etc.)

47. The information in this section is incomplete. The data needs for these units should also include the following: historic upgrades to these systems and the reasons for the upgrade (i.e., leaking, deterioration of system, etc.), age, materials of constructions, presence of catch basins, areas of water or material accumulation, and location specifics. This information is required to accurately define the potential risk associated with these units and to determine the possibility that releases have or may reach the groundwater. Revise the Work Plan to provide the additional details requested above.

4.4.5 Area 2 - Bottom/Fly Ash Area (Pages 4-40 to 4-44)

4.4.5.2 SWMU 2-2: Oil Storage Tank Area (Pages 4-43 and 4-44)

48. This section proposes an investigation of the soils for oil and oil-related constituents through analysis for TPH. Since the tanks were removed and no confirmatory sampling was performed, it would be advisable to include the expanded analyte list for the initial sampling round. Revise the Work Plan to provide for sampling soils from this area for TCL VOCs and TCL SVOCs.

4.4.6 Area 3 - Ammonia Process Area (Pages 4-44 to 4-48)

4.4.6.1 SWMU 3-1: Oil Water Separator Area (Pages 4-45 and 4-46)

49. This section proposes an investigation of oil and oil-related constituents in the soil through analysis for TPH. This unit is still in operation, significant soil staining has been observed, and no prior sampling has been performed. Therefore, releases have occurred and TCL VOCs and TCL SVOCs should be added to the analyte list for the initial sampling round. Revise the Work Plan to provide for sampling soils from this area for TCL VOCs and TCL SVOCs and to perform a nature and extent investigation instead of confirmatory sampling.

4.4.6.2 SWMU 3-2: Vehicle Repair Facility (page 4-46 to 4-48)

50. A 1992 site visit noted visible staining on the soils at the Vehicle Repair Facility which was reportedly due to either releases of waste oils or cleaning solvents. The proposed confirmatory investigation calls for the analysis of samples for TPH. Since a release to the environment is confirmed, a confirmatory sampling plan is not warranted but instead a nature and extent investigation should be proposed at this location. In addition, BTEX and TPH may not detect all potentially present constituents and the proposed analysis should also include TCL VOCs and SVOCs. Revise the Work Pan to address the issues discussed above.

4.4.7 Area 4 - Marshall Plant Waste Area (Pages 4-48 to 4-52)

4.4.7.2 SWMU 4-2: Marshall Plant Waste Pond (Pages 4-50 to 4-52)

51. The Marshall Plant Waste Pond is reported to be a major contributor to contamination at the site. The effects if any of the production wells on the groundwater flow in the vicinity of this unit need to be defined. This is significant because groundwater plumes under the facility are already intermingled, and if the Marshall Plant Waste

Pond has contributed or is contributing to this contamination, then the specific contributions to the plumes and the groundwater plume flow patterns may vary significantly. Revise the Work Plan to expand the data assessment in this area to include the effects of production well usage on plumes of groundwater contamination.

4.4.8 Area 5 - Marshall Plant Product Area (Pages 4-52 to 4-59)

4.4.8.5 AOC 5-3A: Gasoline Storage Facility (Pages 4-58 and 4-59)

52. This site includes storage of gasoline over an earthen surface with no previous investigations at this unit. The potential exists for VOCs/BTEX constituents to be present if a release has occurred. BTEX constituents are listed in Table 4-1 but not in Table 5-6. Ensure that BTEX analysis will be performed on samples from this area.

4.4.11 Area 8 - Chlorine and Caustic Process Area (Pages 4-72 to 4-91)

4.4.11.14 AOC 8-4A: Graphite Cell Production Area (Pages 4-88 and 4-89)

53. This section states that releases of lead, tin, and mastic are know to have occurred in this area; however, information on the nature and extent of these releases is not provided. Revise the Work Plan to provide information on the number and timing of these releases, the material released, cleanup and disposal information, and available analytical results.

4.4.12 Area 9 - Power Plant Area (Pages 4-91 to 4-96)

4.4.12.2 SWMU 9-2: Former Bottom/Fly Ash Lagoon (Pages 4-93 and 4-94)

54. The RFI investigation for this unit is proposed for soils adjacent to the unit. In addition, the lagoon was recently filled in with river dredgings of an unknown quality. The potential for migration of hazardous constituents from this unit has not been discussed and may be enhanced or diminished by the placement of river dredgings. Indicate whether any testing was performed on the river dredgings prior to placement. Provide analytical results if available for the dredgings or propose the collection of soil/sediment samples of this material for an expanded list of analytical parameters in addition to the samples proposed for collection adjacent to the unit.

4.4.13 Area 10 - Inorganics Process Area (Pages 4-96 to 4-99)

4.4.13.2 AOC 10-1A: Soil in Inorganics Area (Pages 4-98 and 4-99)

55. A typographical error seems to be present in this section. A statement in the first paragraph states that monitoring wells will be installed to evaluate site-wide groundwater conditions within Area 6. It is assumed this is an error that should be corrected. If the statement is correct; provide details on how wells in Area 6 will provide information on Area 10, which is approximately 2,000 feet to the southeast. Revise the Work Plan accordingly.

4.5 RFI TASK 9 - GROUNDWATER FLOW MODEL (Pages 4-112 and 4-113)

56. The use of the proposed model at this site is based upon steady state conditions. However, steady state conditions are not assured at the site and cannot be assumed. It is possible that turning off, starting, abandoning, or modifying flow of any one of the 27 active production wells could significantly impact the results of groundwater modeling. Revise the Work Plan to provide information on how the impact of the production well operations will be addressed during the modeling and whether the MODFLOW model is most appropriate, considering the site conditions. This is not currently proposed until the performance of Task 13.

57. Current information on groundwater at the site does not take into account the variability imposed through the use of production wells. The last statement in the second paragraph on page 4-112 states that sufficient information exists to complete the steady state groundwater calibration prior to installing Phase III monitoring wells. This has not been adequately proven, and no specific information has been presented to illustrate current groundwater flow regimes. If this information is not currently available, it must be collected prior to initiating any detailed hydrogeologic assessments or modeling. Task 13 in Phase III includes the collection and assessment of a significant volume of data with respect to the current groundwater flow and the variable influences of the production well use. It is recommended that these data on current conditions (i.e., Task 13) be collected in Phase II to allow for use in assessing the groundwater flow and quality data and in the placement of additional monitoring wells. Revise the Work Plan accordingly.

4.6 REPORTING AND DATA ANALYSIS (Pages 4-113 to 4-118)

58. This section discusses the compilation and evaluation of data resulting from the Phase I and Phase II investigations. However, no information is provided on the mechanism(s) for presenting the results of all of these phases or proposals for future phases to the U.S. EPA, for their review and approval. The proposed time line on

Figure 6-2 identifies a block of time between phases for EPA review, but does not provide details on the information to be reviewed. Revise the Work Plan to provide additional details on the scope and content of the submittals (i.e., Phase I Interim Report, Phase III Work Plan, etc.) which will be made to EPA. Describe the format of these submittals and how these will impact future phases of the investigation. Include information on who will approve the results presented in these submittals, to allow for progression to future Phases or Tasks in the RFI.

5.0 FIELD SAMPLING PLAN

5.1 GENERAL FIELD PROCEDURES (Pages 5-1 to 5-6)

5.1.1 Identifying and Surveying Sampling Locations (Page 5-3)

59. The locations of all sampling points will reportedly be surveyed and approved by PPG personnel and/or local utility companies to ensure underground objects or utilities are not encountered. Any requirements to relocate a sampling location will reportedly be directed by PPG or the utility company without input from an ICF Kaiser Engineer or Geologist or the U.S. EPA Project Manager. This is not acceptable. At a minimum, the ICF Kaiser representative familiar with the facility and the scope of the investigation within a certain area should be consulted on appropriate alternate locations. Additionally, the U.S. EPA Project Manager must be consulted prior to any significant relocation (i.e., any relocation that may affect the quality or reliability of the analytical results) of sampling location(s) or deviations from the Work Plan. This will ensure that the new location will provide results representative of the unit and of the original location and will result in data acceptable to U.S. EPA. Revise the Work Plan to include ICF Kaiser and/or U.S. EPA Project Manager, if appropriate, in any decisions regarding sample site relocation.

60. The selection of sampling locations is currently not based upon knowledge of known or suspected releases that may have occurred at a specific area. The selection of biased sample locations is required in these areas to allow for a nature and extent of release investigation as opposed to a confirmatory sampling investigation. Revise the Work Plan accordingly to allow for the collection of biased samples whenever possible.

Additionally, many SWMUs or AOCs are located in areas that are currently paved with concrete or asphalt. These areas will need to be investigated based upon knowledge of past operations, regardless of the accessibility of the area. In circumstances where concrete or asphalt covers the most appropriate sampling location(s), samples should be taken under the paving materials. Revise the Work Plan to provide procedures for the collection of sampling in areas where concrete or asphalt may obscure the most appropriate sampling location. Include procedures to

allow for focusing investigations in paved areas where the concrete or asphalt may be cracked, broken, pitted, or otherwise breached and would allow for a migration pathway for releases.

5.2 PHASE I DATA COLLECTION

5.2.2 RFI Task 2 - Soil Gas Surveys (Pages 5-9 to 5-17)

61. The procedures and equipment described in this section and Section 5.5 of the QAPjP require additional detail. The type of soil gas probes to be used has not been defined. Indicate whether the probes will be actual soil gas probes which are screened or slotted along the sides to allow gas to enter the probe, or whether a piece of hollow stainless steel tubing will be used. If the hollow stainless steel tubing will be used, then the procedure must include retraction of the probe after insertion of approximately 1 foot to allow for the formation of a cavity from which soil gas can be extracted. In addition, a hollow stainless steel tube would require the use of an inert drive point, which aids in the insertion of the tube and prevents the tube from being plugged upon insertion. This point remains in the ground when the hollow probe is retracted. Provide additional detail on the type of probe(s) to be used.

    In addition, the list of soil gas survey constituents is very limited. Revise the Work Plan to provide further discussion on the parameter list to justify the exclusion of all TCL VOCs not listed.

62. The results of the soil gas sampling will reportedly be used in certain circumstances to potentially relocate soil sampling locations. The criteria to be used to determine more appropriate sampling locations has not been provided. Revise the Work Plan to include information on how the data will be reviewed and used to relocate soil samples to more appropriate areas (i.e., biased sampling) determined by the soil gas survey results.

5.2.3 RFI Task 3 - Evaluate Existing Monitoring Wells (Pages 5-17 to 5-19)

63. The evaluation of the existing wells will provide an indication as to the usefulness of several of the wells at the site for investigative purposes. This section does not include information on the criteria to be used in this evaluation and the method that this information will be presented. The data gathered and any determinations made should be provided to U.S. EPA for review. Revise this section to include the definitive criteria to be used in this evaluation and indicate the nature, contents, and format for the evaluation results.

5.2.4 RFI Task 4 - Gauge Production Well Flow Rates (pages 5-19 to 5-21)

64. The historical and current flow rates of the production wells are very important to this investigation, especially in providing documentation on current and historical hydraulic containment. Provide a discussion on how the data from this task will be used to define and document current and historical hydraulic control.

5.2.6 RFI Task 6 - Locate Map and Inspect Sewers, Trenches and Drains (Page 5-27)

65. The justification provided for the lack of any integrity testing of these units is not adequate. Provide additional information on the operation of these units to support the lack of integrity testing through the use of video or other means. In addition, the statement in the second to last paragraph on page 5-27 states that the Phase II investigation will determine the integrity of these units. This is incorrect since no integrity testing is proposed. Revise the Work Plan to include additional information on integrity testing of these units and remove the statement in the second to last paragraph.

5.3 PHASE 2 DATA COLLECTION (Pages 5-28 to 5-216)

66. This main section reportedly contains a description of all activities to be performed during Phase II of the investigation. However, the last subsection, on page 5-216 is related to RFI Task 8. No section is included to discuss the details of Task 9 - Groundwater modeling, which is briefly discussed in Section 4.5. Include a detailed discussion related to Task 9, which supports the investigative activities proposed and the uses of the resulting data.

67. There are several inconsistencies between the investigation proposed in the following subsections and the information needs identified in Sections 4.3 and 4.4. Additionally, confirmatory sampling is proposed at units which have known or suspected releases of hazardous constituents. These units should undergo a nature and extent investigation instead of a confirmatory type investigation. This involves biased sampling around the perimeter of the unit, or near known or suspected release areas, instead of within the unit itself. Review Sections 4.3, 4.4, and 5.3.1.3 to ensure consistency between data needs and the proposed investigation and to ensure the performance of the most appropriate (confirmatory/waste characterization vs. nature and extent) investigation.

5.3.1 RFI Task 7 - Confirmatory Test Borings and Soil Sampling (Pages 5-28 to 5-216)

5.3.1.3 Proposed Locations and Analysis (Pages 5-29 to 5-216)

68. The investigation at SWMU 4-1 proposes soil borings to collect samples for VOC/SVOCs analysis at two locations. One of these locations will be based upon the soil gas survey and will be placed in an area with elevated VOC readings and the other will be placed in an area with no VOC readings. This approach may not be acceptable for the performance of a Risk Assessment at this unit, since one of the samples will potentially result in no elevated VOC readings. Provide the rational for this sampling approach, specifically with respect to the Risk Assessment for this unit, or revise the sampling approach to collect biased samples at this unit.

69. The investigation of the Area 2 Bottom/Fly Ash Units J-3, J-4, and J-5 include the analysis of soils for TAL inorganics, TCLP Metals, Ph, and Boron. Polynuclear Aromatic Hydrocarbons (PAHs) are also a common constituent in fly ash. Revise the proposed analytes to include PAHs at the fly ash units. This potentially applies to SWMU 9-1 as well.

70. The investigation at AOC 5-2A is based upon known releases to the soil as noted by staining of area soils. Since this unit manages fuel oil, the list of analytes proposed should include PAHs. Revise the Work Plan accordingly.

71. Figure 5-20 is reported to show the proposed locations for borings at SWMU 5-6. This figure does not provide these boring locations. Revise this figure to indicate the locations of the four borings proposed for this unit. Additionally, the proposed analytes (TCL VOCs) for SWMU 5-6 are not adequate. Include TCL SVOCs, TCL PCBs and metals, at a minimum, or provide additional justification for only analyzing for TCL VOCs.

72. Figure 5-13 does not provide the specific unit boundaries associated with units J-3, J-4, and J-5. Revise this figure to identify the known or approximated boundaries of these units.

73. The investigation proposed at SWMU 6-3 will reportedly (as stated on page 5-100) use geotechnical samples collected at SWMU 6-1 in the assessment of the general geotechnical parameters in this area. However, the investigation at SWMU 6-1 does not provide for the collection of this information. Revise the Work Plan to provide for the collection of geotechnical samples at one or both of these units.

74. The investigation proposed at SWMU 6-7 requires sampling at the former BHC Pile. The pile has been removed and no apparent unit boundaries have been defined. A discussion should be included on how the sampling locations will be determined, due to the removal of the pile of BHC and the apparent lack of any definitive boundaries.

Revise the Work Plan to include procedures for defining the unit boundaries prior to initiation of sampling.

75. AOC 6-1A is a storage and containment area with a sump, however, the proposed investigation does not provide the location of the sump nor propose any sampling in its vicinity. Revise the text and figure to include information on the sump at this unit, and propose the collection of samples in the vicinity of the sump.

76. This document states in Sections 3.7.8.2 and 4.4.11.9 that mercury has been detected at elevated concentrations around SWMU 8-18, and is potentially attributable to this SWMU. The proposed investigation at this unit calls for the collection of samples around the perimeter of the unit. This approach should be broadened to include additional biased sampling in areas where mercury has been detected during past sampling to allow for an assessment of the nature and extent of the contamination. Revise the Work Plan accordingly.

77. The investigation for SWMU 9-2 does not include the collection of any waste samples to be used to characterize the waste at this unit, nor are historical data presented. The former and current characteristics of the wastes within this unit should be determined. Revise the Work Plan to provide for the collection of waste samples or include information on the wastes managed at this unit.

78. The investigation at SWMU 10-1 is incomplete. This unit is reportedly located over 50 to 60 feet of fill. The collection of samples from only one boring in the center of the unit is not adequate to characterize the wastes or fill material nor is the current analyte list extensive enough based upon the limited information at this unit. Additional sampling within the unit boundaries should be performed to allow for an assessment of the characteristics of the wastes within this unit and the fill material underlying the pond. Revise the document to provide for the collection of these additional samples and include additional parameters for general analysis. Alternatively, provide information on the waste streams deposited into this unit as a method for characterizing the wastes within the unit.

79. The investigation proposed at SWMU 13-3 requires sampling at the site of a former BHC Storage Pile. The pile has been removed and no apparent unit boundaries have been defined. A discussion should be included on how the sampling location will be determined due to the removal of the pile of BHC and the apparent lack of any definitive boundaries. Revise the Work Plan to include procedures for defining the unit boundaries prior to initiation of sampling.

80. The information regarding the sampling approach at AOC 14-2A is unclear. Page 5-213 states that six samples (from unspecified soil regions) will be collected from three borings and, in addition, shallow subsurface (3-5 ft bgs) samples will be collected from two borings, while all boring will have surface samples collected. The text

seems to indicate the collection of samples from three borings while Figure 5-61 identifies five borings. If the sample collection will occur from five borings, then the text and figure must identify the soil region for the six samples from these three borings and the boring locations, as well as which borings will be used for shallow subsurface sample collection.

81. Several of the sampling locations are concrete or asphalt paved. However, the sampling strategy does not include details on the collection of samples from areas where pavement exist. The areas underlying concrete or asphalt pavement may be the most appropriate sample location but may not be sampled due to the extra effort involved in sample collection of this sort. Revise the Work Plan to include procedures for the collection of samples from under concrete or asphalt paved areas as appropriate. Some of the SWMUs or AOCS where this may be an issue include: SWMU 6-1, SWMU 8-4, SWMU 8-14, and numerous other areas.

82. Figure 5-52 is reported to show the proposed locations for borings at AOC 10-1A. This figure does not provide these boring locations. Revise this figure to indicate the locations of the borings proposed for this unit.

5.4 PHASE 3 DATA COLLECTION

5.4.1 RFI Task 10 - Surface and Subsurface Soil Sampling (Page 5-217)

83. The focus of the Phase III soils investigation will be based upon the results of Phase II investigations. This is accurate; however, in this instance the placement of additional sample locations should be biased towards areas of known contamination. For example, if a SWMU requires additional investigation in Phase III due to contamination detected in 2 out of 4 borings taken in Phase II, this section indicates that the entire SWMU will be included in the grid used to determine "random" sample locations. This is not the most appropriate method for choosing additional sample locations. Additional samples should be focussed in the areas nearest the 2 borings which exhibited contamination. Revise the proposed procedures to ensure the biased sampling of soils in Phase III.

5.4.2 RFI Task 11 - Monitoring Well Installation (Pages 5-217 to 5-223, Figure 5-62, Table 5-70)

84. This section, figure, and table provide information on the proposed locations of the additional monitoring wells. It is acceptable that the actual placement may vary slightly, based upon the results of the Phase II investigation; however, any modifications to the proposed placement of these wells must be approved by the U.S. EPA Project Manager prior to installation. Revise the Work Plan to reflect this

approval process.

85. Figure 5-62 does not include the location of wells MW-224S, MW-225S, and MW-226S, which are proposed for installation in Area 4. Revise the Figure to include the proposed locations of these wells.

86. In addition, the wells proposed for Area 1 to assess background groundwater conditions at the facility are relatively close to current production areas, with the exception of MW-202 and MW-202D. The placement of background wells in areas directly adjacent to production areas may not ensure groundwater that is unaffected by contamination. Due to the variability of groundwater flow, these wells should be assessed after installation to ensure they truly provide indications of background groundwater quality. Revise the Work Plan to include this assessment and any contingencies that may be necessary if background quality is in question.

87. Additionally, Section 3.7.1 (first paragraph, page 3-29) indicates that the fine-grained material, which underlies the perched aquifer, is present in Area 1. However, wells to monitor the perched water will only be installed in Areas 2 and 4. Discuss how background concentrations will be established for the perched water and how the lateral and vertical extent of these zones will be established. Revise the Work Plan to address these issues and indicate whether background wells in the perched water table, if applicable, in Area 1 would be warranted.

88. The background wells designated MW-202 and MW-202D may potentially be influenced by recharge from the Ohio River, due to their proximity near the river. This condition would not be appropriate for background wells and must be addressed. Revise the Work Plan to address these issues or provide for the relocation of these wells to areas not directly influenced by recharge to groundwater from the Ohio River.

89. The potential for heaving sands at the site has not been adequately discussed. Indicate the potential for this phenomena to occur site-wide and provide additional discussion of the procedures to be used to counter its effect. Include information on the collection of subsurface samples in areas with heaving sands and discuss an alternative to the use of a wooden plug during drilling operations. Revise the Work Plan to address these issues.

5.4.2.3 Well Installation (Pages 5-220 to 5-222)

90. The installation of additional wells at the site calls for the use of a hollow stem auger (HSA) with a minimum 10-inch outside diameter and completion of the well with 2-inch PVC. Discuss the reasons for using a 10-inch OD HSA for a well casing of 2 inches. In addition, discuss the suitability of using PVC in the wells in areas where

significant levels or organic contamination is present or potentially present. Revise the Work Plan to address these issues.

5.4.2.4 Well Development (Pages 5-222 to 5-223)

91. The development of the wells will reportedly continue until turbidity is below 50 NTUs or until a maximum of 150 gallons has been removed. The development of wells should be performed until parameters (i.e., NTUs) stabilize or until 5 well volumes, inclusive of the annular region, have been removed. Due to the potential for a thick water column and the potentially large volume of water within the annulus, it is conceivable that it may require the removal of more than 150 gallons to achieve adequate development. Revise the Work Plan to remove the 150 gallon maximum, or provide justification for its use.

92. Additionally, the use of 50 NTUs as a target concentration for use during well development may not be appropriate. A limit of 5 NTUs is a more appropriate indicator of parameter stabilization in areas of good water quality. This may vary due to the general quality (turbidity) of the area's groundwater. Revise the document to use this limit or justify the use of 50 NTUs based upon achievable levels for the area.

5.4.3 RFI Task 12 - Groundwater Sampling

5.4.3.3 Sample Collection (Page 5-228)

93. The collection of groundwater samples will be performed using a stainless steel bailer. Ensure that this bailer is a pre-decontaminated bailer, preferably dedicated to the specific well, as indicated in Section 5.3 of the QAPjP. Note that Section 5.3 of the QAPjP states that field decontamination of bailers is not allowed. Revise this section to provide for use of a bailer dedicated to a specific well or at a minimum the use of a pre-decontaminated bailer for sample collection.

6.0 PROJECT MANAGEMENT

6.2 PROJECT RESPONSIBILITIES (Pages 6-2 to 6-6)

6.2.1 Prime Contractor Personnel (Pages 6-2 to 6-5)

94. The statement in the first paragraph of this section is misleading. It states that ICF Kaiser Engineers has tentatively been selected as the prime contractor. Indicate whether this statement is correct or whether ICF Kaiser is likely to remain as the prime. Note that any changes in project personnel (i.e., different prime contractor

and/or personnel) may require approval from the U.S. EPA, including contractor personnel and any revised documents that would need to be submitted. (i.e., QAPjP, Project Management Plan, Health and Safety Plan, etc.) Clarify this discrepancy.

and/or personnel) may require approval from the U.S. EPA, including contractor personnel and any revised documents that would need to be submitted. (i.e., QAPjP, Project Management Plan, Health and Safety Plan, etc.) Clarify this discrepancy.

VOLATILES & SEMIVOLATILES

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
Acenaphthene	83-32-9	X	X	X	1E+3	2E 0	3E-1	1E-2	8270
Acetaldehyde *syn.* Ethanal	75-07-0				9E+1	5E-3	1E-1	1E-1	8240
Acetone *syn.* 2-Propanone	67-64-1	X		X	1E+3	4E 0	1E-1	1E-1	8240
Acetonitrile *syn.* Methyl cyanide	75-05-8			X	5E+2	2E-1	1E-1	1E-1	8240 *
Acetophenone	98-86-2			X	1E+3	4E 0	3E-1	1E-2	8270
Acrolein	107-02-8		X	X	1E+3	7E-1	5E-3	5E-3	8240 *
Acrylamide	79-06-1				2E-1	8E-6	1E-1	1E-1	8260 *
Acrylonitrile	107-13-1		X	X	2E 0	6E-5	5E-3	5E-3	8240 *
Allyl chloride *syn.* 3-Chloropropene	107-05-1			X	5E+1	2E-3	5E-3	5E-3	8240
Aniline *syn.* Benzeneamine	62-53-3			X	2E+2	6E-3	7E-1	1E-2	8270
Benz[a]anthracene	56-55-3	X	X	X	5E-2	1E-4	3E-1	1E-2	8270
Benz[a]anthracene	56-55-3	X	X	X	5E-2	1E-4	9E-3	1E-4	8310
Benzene	71-43-2	X	X	X	4E+1	5E-3	5E-3	5E-3	8260 (8240)
Benzidine	92-87-5		X		5E-3	2E-7	2E 0	3E-2	8270
Benzo[b]fluoranthene	205-99-2	X	X	X	1E 0	2E-4	3E-1	1E-2	8270
Benzo[b]fluoranthene	205-99-2	X	X	X	1E 0	2E-4	1E-2	2E-4	8310
Benzo[k]fluoranthene	207-08-9	X	X	X	8E+1	4E-3	3E-1	1E-2	8270
Benzo[k]fluoranthene	207-08-9	X	X	X	8E+1	4E-3	1E-2	2E-4	8310
Benzo[a]pyrene	50-32-8	X	X	X	2E-1	2E-4	3E-1	1E-2	8270
Benzo[a]pyrene	50-32-8	X	X	X	2E-1	2E-4	2E-2	2E-4	8310
Benzotrichloride	98-07-7				9E-2	3E-6	3E 0	5E-2	8120 /1
Benzyl alcohol	100-51-6	X		X	1E+3	1E+1	3E-1	2E-2	8270
Benzyl chloride	100-44-7				7E 0	2E-4	1E-1	1E-1	8260 (8240)
(2-chloroethyl) ether *syn.* Dichloroethyl ether	111-44-4	X	X	X	1E 0	3E-5	3E-1	1E-2	8270
(2-chloroethyl) ether *syn.* Dichloroethyl ether	111-44-4	X	X	X	1E 0	3E-5	3E-1	3E-3	8270(s) 8110(w)
Bis(2-chloroisopropyl) ether *syn.* Dichloroisopropyl ether	108-60-1	X	X	X	2E+1	5E-4	3E-1	1E-2	8270
Bis(2-ethylhexyl) phthalate *syn.* Diethylhexyl phthalate	117-81-7	X	X	X	8E+1	4E-3	3E-1	1E-2	8270
Bromodichloromethane	75-27-4	X	X	X	9E 0	3E-4	5E-3	5E-3	8260 (8240)
Bromoform *syn.* Tribromomethane	75-25-2	X	X	X	1E+2	4E-3	5E-3	5E-3	8260 (8240)
Butanol *syn.* n-Butyl alcohol	71-36-3				1E+3	4E 0	1E-1	1E-1	8240
Butyl benzyl phthalate	85-68-7	X	X	X	1E+3	1E-1	3E-1	1E-2	8270
Carbon disulfide	75-15-0	X		X	1E+3	4E 0	1E-1	1E-1	8240 *
Carbon tetrachloride *syn.* Tetrachloromethane	56-23-5	X	X	X	9E 0	5E-3	5E-3	5E-3	8260 (8240)
p-Chloroaniline	106-47-8	X		X	3E+2	1E-1	7E-1	2E-2	8270
Chlorobenzene	108-90-7	X	X	X	1E+3	1E-1	5E-3	5E-3	8260 (8240)
p-Chloro-m-cresol	59-50-7	X	X	X	1E+3	2E-1	3E-1	1E-2	8270
Chlorodibromomethane	124-48-1	X	X		1E 0	4E-4	5E-3	5E-3	8260 (8240)
Chloroform	67-66-3	X	X	X	2E+2	6E-3	5E-3	5E-3	8260
2-Chlorophenol	95-57-8	X	X	X	4E+2	2E-1	3E-1	1E-2	8270
Chloroprene *syn.* 2-Chloro-1,3-butadiene	126-99-8			X	1E+3	7E-1	5E-3	5E-3	8260

VOLATILES & SEMIVOLATILES

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
Chrysene	218-01-9	X	X	X	1E+1	2E-4	3E-1	1E-2	8270
Chrysene	218-01-9	X	X	X	1E+1	2E-4	1E-1	2E-3	8310
Cresols	1319-77-3	X		X	1E+3	2E 0	3E-1	1E-2	8270
Cumene *syn.* Isopropyl benzene	98-82-8				1E+3	1E 0	5E-3	5E-3	8240
Dibenz[a,h]anthracene	53-70-3	X	X	X	2E-2	3E-4	3E-1	1E-2	8270
Dibenz[a,h]anthracene	53-70-3	X	X	X	2E-2	3E-4	2E-2	3E-4	8310
Di-n-butyl phthalate	84-74-2	X	X	X	1E+3	4E 0	3E-1	1E-2	8270
o-Dichlorobenzene	95-50-1	X	X	X	1E+3	6E-1	1E-2	1E-2	8260 (8270)
p-Dichlorobenzene	106-46-7	X	X	X	5E+1	7.5E-2	5E-3	5E-3	8260 (8270)
3,3'-Dichlorobenzidine	91-94-1	X	X	X	2E 0	8E-5	3E-1	1E-2	8270
Dichlorodifluoromethane	75-71-8			X	1E+3	7E 0	5E-3	5E-3	8260 (8240)
1,1-Dichloroethane	75-34-3	X	X	X	1E+3	4E 0	5E-3	5E-3	8260 (8240)
1,1-Dichloroethane	75-34-3	X	X	X	1E+3	4E 0	7E-4	7E-4	8021
1,2-Dichloroethane	107-06-2	X	X	X	1E+1	5E-3	5E-3	5E-3	8260 (8240)
1,1-Dichloroethylene *syn.* 1,1-Dichloroethene	75-35-4	X	X	X	2E 0	7E-3	5E-3	5E-3	8260 (8240)
cis-1,2-Dichloroethylene *syn.* cis-1,2-Dichloroethene	156-59-2				8E+2	7E-2	5E-3	5E-3	8260 (8240)
trans-1,2-Dichloroethylene *syn.* trans-1,2-Dichloroethene	156-60-5		X	X	1E+3	1E-1	5E-3	5E-3	8260 (8240)
2,4-Dichlorophenol	120-83-2	X	X	X	2E+2	1E-1	3E-1	1E-2	8270
1,2-Dichloropropane	78-87-5	X	X	X	2E+1	5E-3	5E-3	5E-3	8260 (8240)
1,3-Dichloropropene	542-75-6	X	X	X	6E 0	2E-4	1E-2	1E-2	8240
Diethyl phthalate	84-66-2	X	X	X	1E+3	3E+1	3E-1	1E-2	8270
Diethylstilbesterol	56-53-1				2E-4	7E-9	3E-1	1E-2	8270
3,3'-Dimethoxybenzidine *syn.* Dianisidine	119-90-4				8E+1	3E-3	3E 0	1E-1	8270
Dimethylamine *syn.* DMA	124-40-3				2E+2	7E-2	1E-1	1E-1	8240
7,12-Dimethylbenz[a]anthracene	57-97-6			X	5E-2	1E-6	3E-1	1E-2	8270
3,3'-Dimethylbenzidine *syn.* o-Tolidine	119-93-7			X	1E-1	4E-6	3E-1	1E-2	8270
2,4-Dimethylphenol	105-67-9	X	X	X	1E+3	7E-1	3E-1	1E-2	8270
Dimethyl phthalate	131-11-3	X	X	X	1E+3	4E+1	3E-1	1E-2	8270
1,3-Dinitrobenzene *syn.* m-Dinitrobenzene	99-65-0			X	8E 0	4E-3	3E-1	2E-2	8270
2,4-Dinitrophenol	51-28-5	X	X	X	2E+2	7E-2	2E 0	5E-2	8270
2,4-Dinitrotoluene	121-14-2	X	X	X	2E 0	5E-5	3E-1	1E-2	8270
2,6-Dinitrotoluene	606-20-2	X	X	X	2E 0	5E-5	3E-1	1E-2	8270
Di-n-octyl phthalate	117-84-0	X	X	X	1E+3	7E-1	3E-1	1E-2	8270
1,4-Dioxane	123-91-1			X	1E+2	3E-3	1E-1	1E-1	8260 *
Diphenylamine	122-39-4			X	1E+3	9E-1	7E-1	1E-2	8270
1,2-Diphenylhydrazine	122-66-7		X		1E 0	4E-5	3E-1	1E-2	8270
Epichlorohydrin	106-89-8				1E+2	4E-3	1E-1	1E-1	8010 *
2-Ethoxyethanol *syn* Ethylene glycol monoethyl ether	110-80-5				1E+3	1E+1	1E 0	1E 0	8260 *
Ethyl acetate	141-78-6				1E+3	3E+1	1E-1	1E-1	8240
Ethylbenzene	100-41-4	X	X	X	1E+3	7E-1	5E-3	5E-3	8260 (8240)

VOLATILES & SEMIVOLATILES

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
Ethyl ether *syn.* Diethyl ether	60-29-7				1E+3	7E 0	1E-1	1E-1	8240
Ethyl methacrylate	97-63-2			X	1E+3	3E 0	5E-3	5E-3	8240
Ethyl methanesulfonate	62-50-0			X	4E-3	1E-7	3E-1	1E-2	8270
Ethylene dibromide *syn.* EDB	106-93-4				1E-2	5E-5	5E-3	3E-4	8011
Fluoranthene	206-44-0	X	X	X	1E+3	1E 0	3E-1	1E-2	8270
Fluorene	86-73-7	X	X	X	1E+3	1E 0	3E-1	1E-2	8270
Fluorene	86-73-7	X	X	X	1E+3	1E 0	1E-1	2E-3	8310
Formaldehyde	50-00-0				1E+3	1E-3	/2	1E-2	8315(w) * /2
Formic acid	64-18-6				1E+3	7E 0	2E-1	2E-1	8015 *
Furan	110-00-9				8E+1	4E-2	1E-1	1E-1	8240
Hexachlorobenzene	118-74-1	X	X	X	7E-1	1E-3	3E-1	1E-2	8270
Hexachlorobenzene	118-74-1	X	X	X	7E-1	1E-3	3E-2	5E-4	8120
Hexachlorobutadiene	87-68-3	X	X	X	1E+1	4E-4	5E-3	5E-3	8260 (8120)
Hexachlorocyclopentadiene	77-47-4	X	X	X	6E+2	5E-2	3E-1	1E-2	8270
Hexachloroethane	67-72-1	X	X	X	8E+1	3E-3	3E-1	1E-2	8270
Hexachlorophene	70-30-4			X	2E+1	1E-2	4E-1	5E-2	8270
Indeno[1,2,3-cd]pyrene	193-39-5	X	X	X	1E+1	4E-4	3E-1	1E-2	8270
Indeno[1,2,3-cd]pyrene	193-39-5	X	X	X	1E+1	4E-4	3E-2	4E-4	8310
Isobutyl alcohol	78-83-1			X	1E+3	1E+1	1E-1	1E-1	8240 *
Isophorone	78-59-1	X	X	X	3E+2	9E-3	3E-1	1E-2	8270
Methacrylonitrile	126-98-7			X	8E 0	4E-3	3E-2	3E-2	8240 *
Methanol	67-56-1				1E+3	2E+1	1E-1	1E-1	8240
Methyl bromide *syn.* Bromomethane	74-83-9	X	X	X	1E+2	5E-2	1E-2	1E-2	8260 (8240)
Methyl chloride *syn.* Chloromethane	74-87-3	X	X	X	9E+1	3E-3	1E-2	1E-2	8260 (8240)
Methylene bromide *syn.* Dibromomethane	74-95-3			X	8E+2	4E-1	5E-3	5E-3	8260 (8240)
Methylene chloride *syn.* Dichloromethane	75-09-2	X	X	X	1E+2	5E-3	5E-3	5E-3	8240
3-Methylchloanthrene	56-49-5			X	4E-2	1E-6	7E-1	1E-2	8270
Methyl ethyl ketone *syn.* 2-Butanone	78-93-3	X		X	1E+3	2E 0	1E-1	1E-1	8240 *
Methyl isobutyl ketone *syn.* 4-Methyl-2-pentanone	108-10-1	X		X	1E+3	2E 0	1E-1	1E-1	8240 *
Methyl methacrylate	80-62-6			X	1E+3	3E 0	3E-2	3E-2	8240
Naphthalene	91-20-3	X	X	X	1E+3	1E 0	3E-1	1E-2	8270
Naphthalene	91-20-3	X	X	X	1E+3	1E 0	5E-3	5E-3	8260
2-Naphthylamine	91-59-8			X	1E 0	4E-5	3E-1	1E-2	8270
Nitrobenzene	98-95-3	X	X	X	4E+1	2E-2	3E-1	1E-2	8270
2-Nitropropane	79-46-9				1E-1	4E-6	1E-1	1E-1	8260
N-Nitrosodi-n-butylamine	924-16-3			X	2E-1	6E-6	3E-1	1E-2	8270
N-Nitrosodiethylamine	55-18-5			X	7E-3	2E-7	7E-1	2E-2	8270
N-Nitrosodimethylamine	62-75-9		X	X	2E-2	7E-7	7E-1	1E-2	8270
N-Nitrosodiphenylamine	86-30-6	X	X	X	2E+2	7E-3	3E-1	1E-2	8270
N-Nitrosodi-n-propylamine	621-64-7	X	X	X	2E-1	5E-6	3E-1	1E-2	8270

VOLATILES & SEMIVOLATILES

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
N-Nitrosomethylethylamine	10595-95-6			X	5E-2	2E-6	7E-1	1E-2	8270
N-Nitrosopiperidine	100-75-4			X	3E-2	9E-7	3E-1	1E-2	8270
N-Nitrosopyrrolidine	930-55-2			X	5E-1	2E-5	1E 0	4E-2	8270
Pentachlorobenzene	608-93-5			X	6E+1	3E-2	3E-1	1E-2	8270
Pentachlorophenol *syn.* PCP	87-86-5	X	X	X	9E 0	1E-3	2E 0	5E-2	8270
Phenanthrene	85-01-8	X	X	X	4E+1	2E-3	3E-1	1E-2	8270
Phenanthrene	85-01-8	X	X	X	4E+1	2E-3	5E-1	6E-3	8310
Phenol	108-95-2	X	X	X	1E+3	2E+1	3E-1	1E-2	8270
p-Phenylenediamine	106-50-3			X	2E+1	7E-4	3E-1	1E-2	8270
Phthalic anhydride	88-44-0				1E+3	7E+1	3E 0	1E-1	8270 /3
2-Picoline	109-06-8			X	1E+3	2E 0	5E-3	5E-3	8240
Pyrene	129-00-0	X	X	X	1E+3	1E 0	3E-1	1E-2	8270
Pyridine	110-86-1			X	8E+1	4E-2	5E-3	5E-3	8240
Safrole	94-59-7			X	6E 0	2E-4	3E-1	1E-2	8270
Styrene	100-42-5	X		X	1E+3	1E-1	5E-3	5E-3	8240
Styrene	100-42-5	X		X	1E+3	1E-1	1E-4	1E-4	8021
1,2,4,5-Tetrachlorobenzene	95-94-3			X	2E+1	1E-2	3E-1	1E-2	8270
1,1,1,2-Tetrachloroethane	630-20-6			X	4E+1	1E-3	5E-3	5E-3	8260 (8240)
1,1,2,2-Tetrachloroethane	79-34-5	X	X	X	6E 0	2E-4	5E-3	5E-3	8260 (8240)
1,1,2,2 Tetrachloroethane	79-34-5	X	X	X	6E 0	2E-4	1E-4	1E-4	8310
Tetrachloroethylene *syn.* Perchloroethylene	127-18-4	X	X	X	8E+2	5E-3	5E-3	5E-3	8260 (8240)
2,3,4,6-Tetrachlorophenol	58-90-2			X	1E+3	1E 0	3E-1	1E-2	8270
Toluene	108-88-3	X	X	X	1E+3	1E+0	5E-3	5E-3	8260 (8240)
2,4-Toluenediamine	95-80-7				4E-1	1E-5	3E-1	1E-2	8270
2,6-Toluenediamine	823-40-5				1E+3	7E 0	7E-1	2E-2	8270
Toluene diisocyanate	26471-62-5				1E+3	7E-1	3E-1	1E-2	8270 /4
o-Toluidine	95-53-4			X	5E 0	1E-4	3E-1	1E-2	8270
p-Toluidine	106-49-0				6E 0	2E-4	3E-1	1E-2	8270
1,2,4-Trichlorobenzene	120-82-1	X		X	8E+2	9E-3	3E-1	1E-2	8260 (8270)
1,1,1-Trichloroethane	71-55-6	X	X	X	1E+3	2E-1	5E-3	5E-3	8260 (8240)
1,1,2-Trichloroethane	79-00-5	X	X	X	2E+1	5E-3	5E-3	5E-3	8260 (8240)
Trichloroethylene	79-01-6	X	X	X	1E+2	5E-3	5E-3	5E-3	8260 (8240)
Trichlorofluoromethane	75-69-4			X	1E+3	1E+1	5E-3	5E-3	8260 (8240)
2,4,5-Trichlorophenol	95-95-4	X		X	1E+3	4E 0	2E 0	5E-2	8270
2,4,6-Trichlorophenol	88-06-2	X	X	X	1E+2	3E-3	6E-1	1E-2	8270
1,2,3-Trichloropropane	96-18-4			X	5E+2	2E-1	5E-3	5E-3	8260 (8240)
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1				1E+3	1E+3	5E-3	5E-3	8260
sym-Trinitrobenzene *syn* 1,3,5-Trinitrobenzene	99-35-4			X	4E 0	2E-3	7E-1	1E-2	8270
Tris(2,3-dibromopropyl) phosphate	126-72-7				1E-1	3E-6	7E 0	2E-1	8270
Vinyl chloride	75-01-4	X	X	X	6E-1	2E-3	1E-2	1E-2	8240

VOLATILES & SEMIVOLATILES

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
Vinyl chloride	75-01-4	X	X	X	6E-1	2E-3	2E-4	2E-4	8021
Xylene (total)	1330-20-7	X		X	1E+3	1E+1	5E-3	5E-3	8260 (8240)

DIOXINS & DIBENZOFURANS

HAZARDOUS CONSTITUENT	CAS NO.	TCL PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
2,3,7,8-TCDDioxin	1746-01-6		X	7E-6	5E-8	2E-3	1E-5	8280
2,3,7,8-PeCDDioxins			X	1E-5	4E-10	2E-3	1E-5	8280
2,3,7,8-HxCDDioxins			X	7E-5	2E-9	2E-3	1E-5	8280
2,3,7,8-HpCDDioxins				7E-4	2E-8	2E-3	1E-5	8280
OCDDioxins	3268-87-9			7E-3	2E-7	2E-3	1E-3	8280
2,3,7,8-TCDFuran	51207-31-9		X	7E-5	2E-9	2E-3	1E-5	8280
1,2,3,7,8-PeCDFuran			X	1E-4	4E-9	2E-3	1E-5	8280
2,3,4,7,8-PeCDFuran	57117-31-4		X	1E-5	4E-10	2E-3	1E-5	8280
2,3,7,8-HxCDFurans			X	7E-5	2E-9	2E-3	1E-5	8280
2,3,7,8-HpCDFurans				7E-4	2E-8	2E-3	1E-5	8280
OCDFurans				7E-3	2E-7	2E-3	1E-5	8280

PESTICIDES & PCB'S

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
Aldrin	309-00-2	X	X	X	7E-2	2E-6	3E-3	4E-5	8080
Aramite	140-57-8			X	4E+1	1E-3	7E-1	2E-2	8270
alpha-BHC *syn.* alpha-Hexachlorocyclohexane	319-84-6	X	X	X	2E-1	6E-6	2E-3	3E-5	8080
beta-BHC *syn* beta-Hexachlorocyclohexane	319-85-7	X	X	X	6E-1	2E-5	4E-3	6E-5	8080
gamma-BHC *syn.* Lindane	58-89-9	X	X	X	9E-1	2E-4	3E-3	4E-5	8080
Chlordane	57-74-9	X	X	X	9E-1	2E-3	2E-3	5E-5	8080
Chlorobenzilate *syn.* Ethyl-4,4'-dichlorobenzilate	510-15-6			X	1E+3	7E-1	3E-1	1E-2	8270
DDD	72-54-8	X	X	X	5E 0	1E-4	3E-3	1E-4	8080
DDE	72-55-9	X	X	X	3E 0	1E-4	3E-3	4E-5	8080
DDT	50-29-3	X	X	X	3E 0	1E-4	3E-3	1E-4	8080
[illegible]llate	2303-16-4			X	2E+1	6E-4	3E-1	1E-2	8270
1,2-Dibromo-3-chloropropane *syn.* DBCP	96-12-8			X	8E-1	2E-4	5E-3	3E-5	8260(s) 8011(w)
2,4-Dichlorophenoxyacetic acid *syn.* 2,4-D	94-75-7			X	8E+2	7E-2	1E 0	2E-3	8150
Dieldrin	60-57-1	X	X	X	7E-2	2E-6	1E-3	2E-5	8080
Dimethoate	60-51-5			X	2E+1	7E-3	3E-1	1E-2	8270
Dinoseb *syn.* 2-(sec-Butyl)-4,6-dinitrophenol or DNBP	88-85-7			X	8E+1	7E-3	7E-1	2E-2	8270
Disulfoton	298-04-4			X	3E 0	1E-3	3E-1	2E-3	8270(s) 8140(w)
Endosulfan	115-29-7	X	X	X	4E 0	2E-3	9E-3	1E-4	8080
Endothall	145-73-3				1E+3	1E-1	/2	9E-2	8045 /2
Endrin	72-20-8	X	X	X	2E+1	2E-3	3E-3	6E-5	8080
Ethylene dibromide *syn.* EDB	106-93-4				1E-2	5E-5	5E-3	3E-4	8260(s) 8011(w)
Famphur *syn.* Famophos	52-85-7			X	3E 0	1E-3	7E-1	2E-2	8270
Heptachlor	76-44-8	X	X	X	2E-1	4E-4	2E-3	3E-5	8080
[illegible]achlor epoxide (alpha,beta,gamma isomers)	1024-57-3	X	X	X	1E-1	2E-4	2E-3	5E-5	8080
[illegible]oxychlor	72-43-5	X		X	4E+2	4E-2	1E-1	2E-3	8080
Methyl parathion	298-00-0			X	2E+1	9E-3	3E-1	1E-2	8270
Octamethyl pyrophosphoramide *sym.* Schradan or OMPA	152-16-9				2E+2	7E-2	7E 0	2E-1	8270
Parathion	56-38-2			X	5E+2	2E-1	3E-1	1E-2	8270
Pentachloronitrobenzene *syn.* PCNB	82-68-8			X	4E 0	1E-4	1E 0	2E-2	8270
Pentachlorophenol *syn.* PCP	87-86-5	X	X	X	9E 0	1E-3	2E 0	5E-2	8270
Phorate	298-02-2			X	2E+1	7E-3	3E-1	1E-2	8270
Polychlorinated biphenyls (PCB's)	1336-36-3	X	X	X	1E+1	5E-4	4E-2	7E-4	8080
Pronamide	23950-58-5			X	1E+3	3E 0	3E-1	1E-2	8270
Strychnine & salts	57-24-9				2E+1	1E-2	1E 0	4E-2	8270
2,3,4,6-Tetrachlorophenol	58-90-2			X	1E+3	1E 0	3E-1	1E-2	8270
Tetraethyl dithiopyrophosphate *syn.* Sulfotepp or TEDP	3689-24-5			X	4E+1	2E-2	3E-1	1E-2	8270
Toxaphene	8001-35-2	X	X	X	1E 0	3E-3	2E-1	2E-3	8080
2,4,5-Trichlorophenoxyacetic acid *syn.* 2,4,5-T	93-76-5			X	8E+2	4E-1	2E 0	2E-3	8150
2,4,5-Trichlorophenoxypropionic acid *syn.* 2,4,5-TP(Silvex)	93-72-1			X	6E+2	5E-2	2E 0	2E-3	8150

INORGANICS

HAZARDOUS CONSTITUENT	CAS NO.	TCL	PPL	APP IX	HBN SOIL mg/kg	HBN WATER mg/l	PQL SOIL mg/kg	PQL WATER mg/l	SUGGESTED METHOD
Antimony	7440-36-0	X	X	X	3E+1	1E-2	2E+1	3E-2	6010(s) 7041(w)
Arsenic	7440-38-2	X	X	X	2E+1	5E-2	7E-1	1E-2	7060
Barium	7440-39-3	X		X	1E+3	2E 0	1E 0	2E-2	6010
Beryllium	7440-41-7	X	X	X	3E-1	1E-3	2E-1	3E-3	6010
Cadmium	7440-43-9	X	X	X	4E+1	5E-3	2E 0	1E-3	6010(s) 7131(w)
Chromium	7440-47-3	X	X	X	4E+2	1E-1	4E 0	1E-2	6010(s) 7191(w)
Lead	7439-92-1	X	X	X	5E+2	1.5E-2	2E+1	1E-2	6010(s) 7421(w)
Mercury	7439-97-6	X	X	X	2E+1	2E-3	1E-1	2E-3	7470
Nickel	7440-02-0	X	X	X	1E+3	1E-1	8E 0	2E-1	6010
Selenium	7782-49-2	X	X	X	4E+2	5E-2	4E+1	2E-2	6010(s) 7740(w)
Silver	7440-22-4	X	X	X	4E+2	2E-1	4E 0	2E-3	6010(s) 7761(w)
Thallium	7440-28-0	X	X	X	6E 0	2E-3	2E+1	1E-2	6010(s) 7841(w)
Vanadium	7440-62-2	X		X	6E+2	2E-1	4E 0	8E-2	6010
Zinc	7440-66-6	X	X	X	1E+3	7E 0	1E 0	2E-2	6010
Cyanide (amenable)	57-12-5				1E+3	2E-1	4E-2	4E-2	9010

FOOTNOTES

HBN - Health-based number.

PQL - Practical quantitation limit.

1 - Benzotrichloride is hydrolytically unstable. Analyze for benzoic acid.

2 - Method not currently available for soil analysis.

3 - Phthalic anhydride is hydrolytically unstable. Analyze for phthalic acid.

4 - Toluene diisocyanate is hydrolytically unstable. Analyze for toluene diamine.

* - Indicates constituent should be analyzed by direct injection for analysis of water sample.